# Section 10 Direct Take Permit Application

## I. Title: **Application for a Permit to Enhance the Propagation or Survival of Endangered or Threatened Species Under the Endangered Species Act of 1973**.

## II. Date: June 12, 2002

## III. Applicant:

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## IV. Detailed Program Description:

### *A. Program justification -*

***Intent***

The intent of this Section 10 Permit Application is to recover steelhead in the Upper Columbia River Evolutionarily Significant Unit (ESU) by operating supplementation programs in the ESU that sustain the majority of the steelhead runs and support naturally-spawning populations that are self-sustaining. The steelhead supplementation program described in this application is designed to augment and enhance the numbers and success of naturally-spawning steelhead in upper Columbia River tributaries. This increased productivity is accomplished through the use of broodstocking and management strategies that result in achieving recovery escapement targets and increasing the numbers and proportion of wild and supplementation fish on the spawning grounds.

***Background***

In its review of the status of west coast steelhead (*Oncorhynchus mykiss*) populations, the National Marine Fisheries Service (NMFS) concluded that the naturally-produced steelhead population in the upper Columbia River region (the Columbia River basin upstream of the Yakima River) is clearly not replacing itself (NMFS 1996). Total abundance of steelhead within the Upper Columbia River Steelhead ESU has been relatively stable or increasing in recent years only because of hatchery supplementation programs (NMFS 1996). Hatchery produced steelhead have strongly dominated spawning escapements, with recent contributions estimated to average 54% in the Wenatchee River and 81% in the Methow and Okanogan rivers. This ESU might not exist today if there were no hatchery production based on indigenous upper Columbia River region steelhead stocks (NMFS 1996). Bartlett (WDFW, pers. comm.) used catch record card data reported from above Wells Dam and run composition past Wells Dam from 1989 through 1999 to calculate a mean wild escapement of 10.9% (range 2.5-19%).

Construction of Chief Joseph and Grand Coulee dams has resulted in substantial habitat blockages. Habitat problems associated with hydroelectric dams, irrigation diversions, urbanization and livestock grazing are limiting the productivity of naturally-produced steelhead in the region. The over-riding habitat factor responsible for the chronic depression of wild steelhead stocks is the construction of nine mainstem Columbia River hydroelectric dams within and downstream of the region (WDF et al. 1993). Each of the projects causes direct mortality by altering the natural Columbia River fluvial characteristics, leading to steelhead mortality from dam passage, migrational delay, and predation.

Given existing conditions, and the likelihood that habitat-related factors adversely affecting steelhead productivity in the basin will not be remedied in the near future, steelhead in this region are at high risk of extinction if no hatchery intervention occurs (MCMCP 1997). These circumstances have led NMFS to conclude in their ESA-listing determination regarding steelhead that the Wells Hatchery broodstock presently used by the Washington Department of Fish and Wildlife (WDFW) for supplementation in the region is essential for recovery of the Upper Columbia River Steelhead ESU.

Consistent with the ESA allowance for "the use of all methods and procedures which are 22necessary to bring any endangered species or threatened species to the point at which the measures pursuant to the Act are no longer necessary" (ESA 1973), WDFW and the parties to the Habitat Conservation Plans (HCPs) are using indigenous broodstock to implement a live-trapping, propagation, and transplantation program to sustain and recover the listed population. It is inherent to this program that artificial propagation may have potential direct and indirect deleterious effects on the listed fish (Hard et al. 1992; Cuenco et al. 1993; Campton 1995; Busack and Currens 1995). These effects may include genetic and ecological risks potentially causing maladaptive genetic, physiological, or behavioral changes in donor or target populations, with attendant losses in natural productivity (Hard et al. 1992).

The above risks were weighed against the prospect that a successful supplementation program can produce many more returning adult fish than are produced naturally. Given that extinction of the natural population is likely before natural recovery can occur, WDFW has judged that the continued implementation of a supplementation program using the indigenous steelhead populations is warranted. WDFW believes that risks posed by artificial propagation to the listed population are outweighed by the ability of the supplementation program to rapidly increase Wells-stock steelhead abundance and therefore avoid extinction. The proposed supplementation program is intended to facilitate recovery of the natural population while minimizing the risk of further decline and restricting genetic changes resulting from artificial propagation. Measures designed to minimize and mitigate impacts to listed fish are described in the following sections. When implemented, these measures will help address potential negative genetic and/or ecological consequences of the proposed supplementation program.

Hatcheries have increased total summer steelhead run sizes, and from 1984 through 1999, contributed 90% of lower river returns and 75% of upriver returns (WDFW and ODFW 2000).

In the case of the Upper Columbia River Steelhead ESU, hatchery fish have comprised between 71% and 91% of the returns between 1986 and 2001 (Table 1). The steelhead return at Priest Rapids Dam over the 16 year period from 1986 to 2001 has averaged 82.3% hatchery fish. Total run size estimates for steelhead have been estimated at Priest Rapids Dam since 1974 (Table 1). Within the Upper Columbia River Steelhead ESU, hatchery steelhead will continue to be used for recovery efforts, as well as to provide other biological and societal needs.

**Table 1.** Priest Rapids Dam adult steelhead returns and stock composition summary.

| Year | Hatchery | Hatchery Percent | Wild | Wild Percent | Total Run |
|---|---|---|---|---|---|
| 1974 | - - | | - - | - - | 2,950 |
| 1975 | - - | | - - | - - | 2,560 |
| 1976 | - - | | - - | - - | 9,490 |
| 1977 | - - | | - - | - - | 9,630 |
| 1978 | - - | | - - | - - | 4,510 |
| 1979 | - - | | - - | - - | 8,710 |
| 1980 | - - | | - - | - - | 8,290 |
| 1981 | - - | | - - | - - | 9,110 |
| 1982 | - - | | - - | - - | 10,770 |
| 1983 | - - | | - - | - - | 32,000 |
| 1984 | - - | | - - | - - | 26,200 |
| 1985 | - - | | - - | - - | 34,010 |
| 1986 | 20,022 | 89.5 | 2,342 | 10.5 | 22,364 |
| 1987 | 9,955 | 71.0 | 4,058 | 29.0 | 14,013 |
| 1988 | 7,530 | 73.8 | 2,670 | 26.2 | 10,200 |
| 1989 | 8,033 | 74.9 | 2,685 | 25.1 | 10,718 |
| 1990 | 6,252 | 79.8 | 1,585 | 20.2 | 7,837 |
| 1991 | 11,169 | 80.0 | 2,799 | 20.0 | 13,968 |
| 1992 | 12,102 | 88.2 | 1,618 | 11.8 | 13,720 |
| 1993 | 4,538 | 83.6 | 890 | 16.4 | 5,428 |
| 1994 | 5,880 | 87.3 | 855 | 12.7 | 6,735 |
| 1995 | 3,377 | 77.3 | 993 | 22.7 | 4,370 |
| 1996 | 7,757 | 90.2 | 843 | 9.8 | 8,600 |
| 1997 | 8,157 | 91.2 | 785 | 8.8 | 8,942 |
| 1998 | 4,919 | 84.1 | 928 | 15.9 | 5,847 |
| 1999 | 6,903 | 83.4 | 1,374 | 16.6 | 8,277 |
| 2000 | 9,023 | 79.4 | 2,341 | 20.6 | 11,364 |
| 2001 (Preliminary) | 24,174 | 81.0 | 5,670 | 19.0 | 29,844 |

To identify the relative proportion of hatchery and wild origin steelhead, fish with and without adipose clips, as well as hatchery fish with alternative external/internal marks, have been identified

at Priest Rapids Dam since 1986 (Table 1). A secondary assessment for run composition occurs at Wells Dam as part of the brood collection program (Table 2). The brood stock at Wells Dam is collected from the run at large, and when the fish are spawned, the origin of adipose-present fish is determined using visual implant elastomer (VIE) marks and cheek wire-tags to identify hatchery 'supplementation' fish from 'wild' origin fish. Passive Integrated Transponder (PIT) tags may be used for a portion of future marking programs, based upon recommendations from the Hatchery Committees (Section 8 of: Public Utility District No. 1 of Douglas County et al. 2002, Public Utility District No. 1 of Chelan County et al. 2002a, 2002b) and on research needs.

**Table 2.** Wells Dam adult steelhead returns and stock composition.

| YEAR | ADIPOSE-ABSENT | ADIPOSE-PRESENT | ADIPOSE-PRESENT PERCENT /1 | TOTAL RUN /2 |
|---|---|---|---|---|
| 1998 | 2,487 | 181 | 6.8 | 2,668 |
| 1999 | 3,155 | 402 | 11.3 | 3,557 |
| 2000 | 5,759 | 521 | 8.3 | 6,280 |
| 2001 | 17,614 | 869 | 4.7 | 18,483 |

/1 Percentages of adipose-present steelhead were provided by J. Moore, WDFW (pers. comm.) from the Wells Hatchery database.
/2 Wells total run numbers are from the Northwest Power Planning Council Fish Passage Center.

To determine the appropriate release number of hatchery-origin smolts to assist in achieving the interim escapement objectives (NMFS 2002) for upper Columbia River steelhead, an analysis of subbasin-specific smolt-to-adult return (SAR) data is required. Initial analyses of SAR data have been conducted for the Methow-Okanogan and Wenatchee river sub-basins (Appendix I [Wells], Table 3 [Wenatchee]). Production goals for supplementation are based on meeting minimum escapement goals (Table 4) of naturally-spawning steelhead (NMFS 2002). These goals are detailed in Section C.2.

**Table 3.** Brood year 1996 and 1997 SARs for steelhead smolts released in the Wenatchee River Basin

| Brood Year | Release Year | Number Released | 1-Salt Recovery /4 | 2-Salt Recovery /4 | Total Recovery /4 | PRD Estimated SAR (%) | Wenatchee Estimated SAR (%) /5 |
|---|---|---|---|---|---|---|---|
| 1996 /1 | 1997 | 348,693 | 987 | 324 | 1,311 | 0.38 | 0.33 |
| 1997 /2 | 1998 | 429,422 | 1,198 | 588 | 1,786 | 0.42 | 0.36 |
| 1998 /3 | 1999 | 172,078 | 22 | N/A* | N/A* | N/A* | |

* Pending brood year assignment (age determination) via scale analysis.
/1 Progeny provided by adults collected at Wells Dam.
/2 Progeny provided by adults collected at Priest Rapids Dam and from Dryden and Tumwater Dams in the Wenatchee basin.
/3 Progeny provided from adults collected exclusively in the Wenatchee River basin (Dryden and Tumwater dams).
/4 Estimated number based upon expansion Priest Rapids Dam stock assessment data.
/5 Wenatchee River basin spawning escapement SAR based upon estimated total adult recovery at Priest Rapids Dam, 4% mortality at each dam, and 5% overwinter mortality (per Upper Columbia Steelhead Conservation Management Plan, WDFW 2001).

**Table 4.** Minimum steelhead escapement needs for tributaries (NMFS 2002) and broodstock requirements for areas above Priest Rapids Dam.

| **Tributaries** | **Escapement Requirements** |
|---|---|
| Wenatchee River | 2,500 |
| Entiat River | 500 |
| Methow River | 2,500 |
| Okanogan River * | 600 * |
| Small Tributaries | 200 |
| Wells Hatchery Broodstock | 650 |
| Total | 6,950 |

Note: Ford et al. (2001) did not identify an abundance goal for the Okanogan due to a lack of sufficient historical information. WDFW will use the BAMP (1998) escapement requirement of 597 as an interim goal until the Technical Review Team has completed its review for this system.

**Smolt-to-Adult Return Analyses**

**Methow-Okanogan Sub-basins**

Based on this analysis, the existing releases of 550,000 smolts would produce 3,100 naturally-spawning adult steelhead returning above Wells Dam (Appendix I) only if the SAR is 0.53% ([Appendix I; Table I-2] and [Table 5]). A review of SARs for 1981 through 1996 brood years indicates that an SAR of 0.53% falls within the 29th percentile of the SAR data set (i.e., we would expect 550,000 smolts to produce 3,100 adults returning above Wells Dam only 71% of the time (Appendix I; Table I-2). Achieving the escapement target of 3,100 adults 71% of the time will not meet the interim recovery target of 3,100 adults annually for eight years.

Planning to achieve returns of 3,100 adult steelhead 80% of the time for eight years is a better approach toward meeting the escapement objectives. The SAR data set indicates that 80% (20th percentile of the SAR data set) correlates to an SAR of 0.47% (Appendix I; Table I-2). At a 0.47% SAR, 550,000 smolts would be expected to provide 2,482 hatchery adults toward a 2,758 adult spawning escapement, which is 342 adults fewer than the interim recovery goal (Table 4). At this same 0.47% SAR, 618,250 smolts would be required to produce 3,100 adult returns 80% of the time (Appendix I; Table I-2). The relative risk of additional smolt production associated with meeting the interim recovery goal 80% of the time should be discussed with the Hatchery Committees identified in the Habitat Conservation Plan process (Public Utility District No. 1 of Douglas County et al. 2002, Public Utility District No. 1 of Chelan County et al. 2002a, 2002b).

**Wenatchee Sub-Basin**

Table 3 provides a summary of SARs of brood year 1996 and 1997 hatchery-origin fish released into the Wenatchee Basin during 1997 and 1998. The analysis is limited to brood years 1996 and 1997 because these were the first two brood years where external marks on steelhead identified release locations. Data from the 1998 brood year were the first to be collected exclusively in the Wenatchee basin (comprised of externally-marked hatchery and wild origin adults). As additional data become available, brood year assignments using stock assessment data from Priest Rapids Dam will provide a brood year SAR for Wenatchee origin steelhead returning to the Wenatchee Basin.

Table 6 projects the total adult steelhead return to the Wenatchee Basin based on the current production objective of 400,000 smolt releases and uses SARs generated from returns of brood years 1996 and 1997. Using these SARs, it appears that a shortfall in adult steelhead returns can be expected at release levels of 400,000 smolts. At an SAR of 0.33%, it would be necessary to release approximately 480,000 smolts to achieve the escapement objective of 2,500 adult steelhead identified in the interim recovery document (NMFS 2002). At an SAR of 0.36%, it would be necessary to release nearly 440,000 smolts to achieve the target escapement.

**Table 5.** Smolt/Adult return of Wells Stock, hatchery-origin upper Columbia River summer steelhead for brood years 1981-1996.

| Brood Year | Release Year | Number Smolts | Total Brood Year Return to Wells | 1-Salt | 2-Salt | % BY Return | Adult Return Past Wells | 1-Salt | 2-Salt | % Return |
|---|---|---|---|---|---|---|---|---|---|---|
| 1981 | 1982 | 379,472 | 28,615 | 19,140 | 9,475 | 7.54 | 27,734 | 18,636 | 9,098 | 7.31 |
| 1982 | 1983 | 494,784 | 17,236 | 7,444 | 9,791 | 3.48 | 16,768 | 7,148 | 9,620 | 3.39 |
| 1983 | 1984 | 466,545 | 18,421 | 9,791 | 8,630 | 3.95 | 17,948 | 9,620 | 8,328 | 3.85 |
| 1984 | 1985 | 413,066 | 7,556 | 4,854 | 2,702 | 1.83 | 7,122 | 4,684 | 2,438 | 1.72 |
| 1985 | 1986 | 452,844 | 5,517 | 2,702 | 2,815 | 1.22 | 4,888 | 2,438 | 2,450 | 1.08 |
| 1986 | 1987 | 564,315 | 3,220 | 1,654 | 1,566 | 0.57 | 2,791 | 1,439 | 1,352 | 0.49 |
| 1987 | 1988 | 826,208 | 5,727 | 3,040 | 2,686 | 0.69 | 4,880 | 2,625 | 2,255 | 0.59 |
| 1988 | 1989 | 623,003 | 4,201 | 1,323 | 2,878 | 0.67 | 3,766 | 1,111 | 2,655 | .060 |
| 1989 | 1990 | 740,433 | 8,845 | 4,696 | 4,149 | 1.19 | 8,136 | 4,331 | 3,805 | 1.10 |
| 1990 | 1991 | 656,997 | 5,169 | 3,067 | 2,102 | 0.79 | 4,509 | 2,812 | 1,697 | 0.69 |
| 1991 | 1992 | 514,610 | 2,408 | 701 | 1,707 | 0.47 | 1,895 | 566 | 1,329 | 0.37 |
| 1992 | 1993 | 511,295 | 1,461 | 919 | 542 | 0.29 | 1,050 | 716 | 334 | 0.21 |
| 1993 | 1994 | 420,110 | 2,144 | 813 | 1,331 | 0.51 | 1,722 | 500 | 1,222 | 0.41 |
| 1994 | 1995 | 450,395 | 5,351 | 2,961 | 2,390 | 1.19 | 4,867 | 2,720 | 2,147 | 1.08 |
| 1995 | 1996 | 328,100 | 3,432 | 2,036 | 1,396 | 1.05 | 3,039 | 1,829 | 1,210 | 0.93 |
| 1996 | 1997 | 477,900 | 2,775 | 1,453 | 1,322 | 0.58 | 2,270 | 1,260 | 1,010 | 0.47 |
| 1997 | 1998 | 478,327 | 2,849 | 2,157 | | | 1,649 | 1,649 | | |
| 1998 | 1999 | 843,385 | 3,479 | | | | | | | |
| 1999 | 2000 | | | | | | | | | |
| 2000 | 2001 | | | | | | | | | |
| 2001 | 2002 | | | | | | | | | |
| 2002 | 2003 | | | | | | | | | |
| Median | | | | | | 0.92 | | | | 0.81 |
| Mean | | | | | | 1.63 | | | | 1.52 |

However, it is not appropriate to rely solely on these two data points. Brood year 1996 consisted of progeny derived from adults collected at Wells Dam, and the 1997 brood year data were derived from collections at Priest Rapids Dam and the Wenatchee River. Brood year 1996 and 1997 SAR data should be augmented with additional information from adult returns from brood years 1998 and beyond to derive statistically-sound SAR levels. As data become available, SAR analyses will be provided to the Hatchery Committees for negotiating future smolt release levels and marking criteria.

**Table 6.** Projected hatchery and wild steelhead adult returns to the Wenatchee River basin under the current production objective of 400,000 smolts.

| Smolt Release /1 | Smolt to Adult Return /2 | Hatchery Adults | Wild Adults /3 | Total Estimated Return | Interim Adult Objective | Shortfall |
|---|---|---|---|---|---|---|
| 400,000 | 0.33% | 1,320 | 775 | 2,095 | 2,500 | -405 |
| 400,000 | 0.30% | 1,440 | 845 | 2,285 | 2,500 | -215 |

/1 Current smolt production objective for the Wenatchee Basin (ESA Section 10 Permit #1094).
/2 Wenatchee Basin spawning escapement SAR based on brood year 1996 and 1997 estimated total adult recovery at Priest Rapids. Assumes 4% adult mortality at each dam and 5% overwinter mortality (per Upper Columbia Steelhead Harvest Model, WDFW 2001)
/3 Based on 37% average wild composition observed in broodstock collections in the Wenatchee Basin for brood years 1999-2001.

The Wenatchee Basin smolt release numbers should remain the same and continue marked only with VIE external tags to provide definitive brood year identification. In future years we will analyze complete brood year return data for Wenatchee River basin steelhead. Stock origin will be evaluated to determine SARs and develop smolt release levels consistent with development/implementation of a localized Wenatchee River Basin broodstock.

***Hatchery Smolt Production***

Releases of steelhead will be of hatchery-hatchery (HxH or "hatchery"), hatchery-wild (HxW or "supplementation"), and wild-wild (WxW or "wild parentage") origin. The origin of returning adults may be determined by reading various visual marks such as fin clips (adipose, ventral), VIE marks and/or PIT tags (Table 7).

**Table 7.** Representative hatchery steelhead marking strategies from Upper Columbia WDFW facilities. All numbers and locations are subject to change based on broodstock composition and availability of facility.

| Hatchery | Release Site | Stock | Purpose | Mark | Approximate 2002 Release |
|---|---|---|---|---|---|
| Wells | Methow River | Wells HxW | Recovery/test | VIE/PIT | 320,000 |
| | Methow River | Wells HxH | Recovery/control | Ad/VIE/PIT | /1 |
| | Okanogan River | Wells HxH | Recovery | Ad | 70,000 |
| | Methow River | Wells HxH | Recovery | Ad | /1 |
| | Similkameen | Wells HxH | Recovery | Ad | 60,000 |
| | River | Wells HxH | Mainstem studies | Ad/PIT | - - |
| | Columbia River | Wells HxH | General release | Ad | - - |
| | Columbia River | | | | |
| Winthrop | Methow River | Wells HxH | Recovery | Ad | 100,000 |
| Turtle Rock | Wenatchee River | Wenatchee HxH | Recovery/control | VIE/PIT/Ad | 50,000 |
| & Eastbank | Wenatchee River | Wenatchee HXW | Recovery test | VIE/PIT | 200,000 |
| | Wenatchee River | Wenatchee WxW | Recovery test | VIE/PIT | 150,000 |
| Ringold | Columbia River | Wells HxH | General release | Ad/RV | 180,000 |

/1 In the event that HxW plants are significantly under program (i.e. below 320,000 smolts), HxH steelhead will be used in the Methow Basin to achieve the total 320K Methow release target. This location would be best for maintaining stock separation of the returning adults.

Although upper Columbia River hatchery steelhead are genetically similar to wild fish, there is potential risk in allowing a disproportionally high level of hatchery fish to spawn. WDFW addresses this concern in the *Wild Salmonid Policy* (WDFW 1997), which states that even with a high level of genetic similarity between hatchery and wild fish, the hatchery component should not comprise more than 10% of the naturally spawning population, except in the case of supplementation programs intended to sustain the stock for reasons other than harvest (e.g., habitat degradation, hydropower dams, unforeseen catastrophic loss). Under present circumstances, the proportion of hatchery fish rarely is less than 50% in the upper Columbia River tributaries.

Conversely, if hatchery steelhead are "essential for recovery," the degree of use of hatchery fish must be reassessed to accommodate hatchery strategies. This includes selecting fish to reflect the most appropriate return and spawn timing, the use of acclimation ponds to imprint juvenile steelhead to return as adults to specific sites, and the removal of excess hatchery fish by a combination of methods including recreational harvest and removal at fish passage and collection facilities. The 10% level identified in the *Wild Salmonid Policy* may be useful as a guideline, but can not be given strict adherence because of mortalities attributed to hydropower facilities in the Columbia River, and in situations of low run sizes caused by poor freshwater and marine survival. Such impacts can put this stock in jeopardy because wild fish cannot replace themselves given the cumulative impacts from hydropower projects.

Allowing large numbers of hatchery steelhead to spawn in the wild may have an overall negative impact to wild steelhead spawning and wild juvenile steelhead survival. This permit application describes the removal of excess marked HxH returning adults at hatchery and dam collection facilities, and through recreational fisheries, when supplementation goals have been attained.

***B. General Program Description -***

WDFW operates three major hatchery complexes within the mid and upper Columbia River basin that encompass steelhead operations not under a federal nexus - Wells, Eastbank, and Priest Rapids hatcheries (Figure 1). These complexes are funded by several Public Utility Districts to mitigate for lost wild salmonid production and harvest opportunities resulting from hydroelectric dam placement and operation. Funding levels through the Douglas and Chelan PUDs Habitat Conservation Plans have been adopted to produce 400,000 smolts in the Wenatchee basin and 348,858 steelhead smolts in the Methow-Okanogan basins in facilities managed by WDFW in the Turtle Rock, Eastbank, Chelan, and Wells complexes. Analyses of smolt-to-adult return rates indicate that higher levels of smolt releases may be necessary to achieve the interim adult steelhead escapement targets, as described in Section 4.A. of this application. The WDFW will strive to obtain resources necessary to increase smolt releases to meet escapement goals 80% of the time. Detailed descriptions of the steelhead hatcheries and their current production objectives are shown in Appendix II.

This permit application addresses artificial propagation of listed steelhead and research activities occurring at these hatchery complexes, including the removal of returning adult fish excess to propagation and supplementation needs, proposed for a five-year period commencing in the fall of 2002. Steelhead within the Upper Columbia River Steelhead ESU will be intentionally taken as broodstock by WDFW to enhance the population status of the species through artificial propagation at hatchery facilities. In addition, stock status data for the listed population will be collected through a sampling program at the Priest Rapids Dam trap, which will return all steelhead live to the river. Activities that will lead to the intentional take of the listed population will include:

- biological sampling, tagging, and upstream release of migrating adult steelhead at Priest Rapids Dam for stock status evaluation;
- removal of adults through trapping operations at Wells Hatchery, the Dryden and Tumwater dam traps on the Wenatchee River, and in the Methow and Okanogan rivers for hatchery broodstock and future experiments assessing the reproductive success of wild and hatchery adults;
- holding and artificial spawning of adults at the Wells and Eastbank hatcheries;
- incubation and propagation from fertilized eggs through the smolt life stage at the Wells, Eastbank, Chelan, and Turtle Rock hatcheries;
- propagation from eyed-egg to smolt at Klickitat and Ringold hatcheries;
- transfer of eyed-eggs from Wells Hatchery to Winthrop National Fish Hatchery (NFH) and to Klickitat/Ringold fish hatcheries
- transfer of smolts for release into the Wenatchee River from the Eastbank and Turtle Rock hatcheries;

- transfer of smolts for release into the Methow and Okanogan river systems from Wells Hatchery;
- transfer of smolts at Ringold Springs Rearing Pond (RSRF) for release into the Columbia River;
- removal from the system of returning adult hatchery-origin fish that are excess to spawning and other recovery needs through use of recreational fisheries and direct removal at fishways.

Steelhead propagation activities proposed in this permit application are the subject of an on-going conservation planning initiative in the mid-Columbia River basin designed to bolster the productivity of salmonid populations in a manner that is compatible with self-sustaining populations. Recently completed Habitat Conservation Plans (Public Utility District No. 1 of Douglas County et al. 2002, Public Utility District No. 1 of Chelan County et al. 2002a, 2002b) for Wells, Rock Island, and Rocky Reach Hydroelectric projects will be incrementally implemented starting in 2002 as regulatory review and approvals are concluded. The HCPs require the hatchery program implementation to be "consistent with overall objectives of rebuilding natural populations". Specific hatchery program objectives may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecological integrity, and supporting harvest. The Hatchery Program presented in the HCPs will concentrate on strategies that encourage local adaptation of supplemented stocks and increased productivity to compensate for unavoidable losses at hydroelectric projects.

WDFW intends to ensure that supplementation activities proposed in this permit application are consistent with the HCPs. The objective for the permit application and HCPs is for hatchery production of steelhead to recover self sustaining wild anadromous populations to healthy levels. It is recognized, however, that the success of the supplementation program depends upon remedying all factors responsible for the species' decline. The successful establishment of self-sustaining wild steelhead populations is highly dependent on habitat rehabilitation and protection, and on the correction of factors affecting steelhead migration.

Studies are currently underway on the Wenatchee River to determine the extent of hatchery smolt residualization occurring from Eastbank releases. In addition, to investigate the efficacy of the hatchery programs in rebuilding self-sustaining populations, independent studies are underway to determine the relative survival and success of HxH, HxW, and WxW progeny from supplementation-based recovery programs in the Wenatchee and Methow river basins. Preliminary results of these two studies will be presented in the respective annual brood year progress reports as they are completed.

In addition to maintaining consistency with the HCPs, annual allowable steelhead production levels must also be consistent with ESA protective requirements for listed Snake River chinook, sockeye and steelhead, middle Columbia River steelhead, and lower Columbia River chinook and chum salmon and steelhead populations, fulfillment of federal treaty obligations to Native

Americans, fulfillment of court-approved actions developed under the auspices of United States v. Oregon, the discharge of fisheries mitigation responsibilities incurred as a result of water development authorizations, and achievement of U.S./Canada Pacific Salmon Treaty obligations (CBFWA 1996). Production levels described in this application are also compatible with allowable levels defined through the basin-wide annual production ceilings set by NMFS (NMFS 1995, 1999). Existing policies affecting hatcheries in the Columbia River Basin are detailed in the 1994 Integrated Hatchery Operations Team (IHOT) Annual Report (IHOT 1995). Hatchery operation and maintenance protocols are guided by basin-wide policies and standards developed by IHOT, a multi agency group with oversight authority for production in the Columbia and Snake river basins. These policies and performance standards are intended to address fish health, genetics, local ecological interactions, hatchery practices, and hatchery operations (IHOT 1995).

**C.** ***Detailed descriptions of proposed program activities -***

***1. Adult steelhead broodstock collection operations and research -***

The primary objective of broodstock trapping efforts conducted through the steelhead supplementation program is to collect locally adapted adults representative of extant native populations. Achievement of this objective will allow for the preservation and amplification of local adaptation and distinctiveness of native populations within WDFW's artificial production efforts. Preferred strategies for broodstock collection and spawning at each facility will be developed within annual broodstock protocols. Detailed broodstock and spawning protocols proposed for use in 2002 are attached (Appendix III).

WDFW will develop annual spawning protocols of the hatchery population to maintain spawn timing which resembles that of fish in the wild. Because of annual variation in expected adult return numbers and origins (hatchery/wild), these protocols will be reviewed jointly by WDFW and NMFS staff prior to the annual implementation of operations to ensure optimal success of the annual broodstock collection program. Following are detailed descriptions of broodstock collection and research activities proposed for authorization under this permit application.

a) Wenatchee Basin

Since 1989, when the current steelhead supplementation program began, the steelhead supplementation program for the Wenatchee River Basin has relied entirely on Wells Hatchery broodstock. This broodstock is collected at Wells Dam and as volunteers to Wells Hatchery. In 1996, the program began incorporating Wenatchee River broodstock into the supplementation effort. In the HCP (Public Utility District No. 1 of Chelan County et al. 2002a, 2002b), rebuilding of Wenatchee steelhead stock in 2002 and beyond is proposed to occur through a recovery supplementation program based on a locally adapted broodstock. Although the program will still use Wells-origin broodstock trapped as returning adults in the Wenatchee River, it is unlikely that this recovery program will return to using of broodstock obtained directly from returns at Wells Hatchery. The Entiat population is considered a naturally-recruiting, non-supplemented population, acting as a "control" for the steelhead supplementation program for the Upper Columbia River Steelhead ESU.

Broodstock for use in the Wenatchee Basin steelhead supplementation program will be collected at trapping sites associated with Dryden and Tumwater dams on the Wenatchee River. Broodstock will be of locally adapted, wild lineage (an upper Columbia River native-origin stock influenced by the Grand Coulee Fish Maintenance Program (GCFMP)), and of Wells hatchery lineage resulting from recent year outplants into the Wenatchee River. Since 2001, hatchery origin fish collected for broodstock have had at least one (HxW) or two (WxW) wild parents. The initial collection target for the Wenatchee supplementation program will be 208 wild/natural steelhead and hatchery fish at the Dryden and Tumwater sites. Facility constraints, including low broodstock trapping effectiveness at Dryden, may limit the ability to collect enough wild broodstock at the two locations. Hook and line capture of unmarked fish by qualified, volunteer anglers and/or by WDFW personnel may be used to supplement broodstock collection if the traps are not effective. The broodstock origin targets for fish to be supplemented into the Wenatchee River is 50% Wenatchee wild-origin and 50% Wenatchee hatchery-origin supplementation steelhead from the Eastbank program.

The Dryden Dam trap will operate five days per week from July 1 through mid-November each year. The trap will passively operate 24 hours per day and will be checked daily for captured fish. Staff from the WDFW Hatchery Program will identify all fish captured and make determinations regarding the origin of all steelhead collected. As in the 2001 collection, and as proposed in the 2002 collection, hatchery adult returns that are a product of a HxH parental cross and those hatchery fish of unknown parental origin may be excluded from the broodstock collection.

Eliminating the HxH-origin parental cross may reduce the extent of hatchery influence on future generations and move the hatchery component spawn timing closer to that of wild-origin fish. A Denil ladder in the trap will be operated up to three hours per day to ensure upstream passage of released fish. Steelhead retained as broodstock will be held and spawned at Wells Hatchery. Steelhead carcasses will be used for stream nutrient enhancement, buried on-station or at an appropriate landfill after completion of spawning at Wells Hatchery.

When combined with Dryden Dam and/or hook and line collections, the Tumwater Dam facility may collect steelhead, 3 days/week, 16 hours/day, between July 15 and November 14, to attain a total of 208 mixed-origin steelhead according to the above-mentioned parental cross guidelines. Collected fish will be identified by species and, for steelhead, as to wild or hatchery-origin. Steelhead retained as broodstock will be transported to Eastbank FH and Wells Hatchery for holding and spawning. When well water temperatures at Eastbank FH reach approximately $12^0$C, all adult steelhead being held at that location are transferred to Wells Hatchery. Spawning and mating protocols for Wenatchee broodstock held at Wells Hatchery are described in Appendix III. Steelhead carcasses will be used for stream nutrient enhancement, buried on-station or at an appropriate landfill after completion of spawning.

It is unknown how many upper Columbia River steelhead could be collected through trapping operations specifically designed to capture steelhead broodstock at Dryden and Tumwater Dams. Under current salmon broodstock trapping programs, wild steelhead migrating in the Wenatchee River may be trapped, handled, and passed upstream during summer chinook broodstock collection occurring between late July and late October at Dryden Dam, or in sockeye salmon

trapping operations beginning in mid-July at Tumwater Dam (Eltrich et al. 1994a; Eltrich et al. 1994b; Eltrich et al. 1995). During summer chinook and steelhead broodstock collection efforts in 2001, an estimated 123 steelhead were trapped and released at Dryden Dam. Sockeye trapping in 2001 resulted in the capture of 6 steelhead, all of which were retained for broodstock (K. Truscott, WDFW, pers. comm.).

b) Entiat Basin

Entiat River basin steelhead are considered a naturally-recruiting, non-supplemented population, acting as a "control" for the steelhead supplementation program for the Upper Columbia River Steelhead ESU. The Entiat basin was stocked with Wells-stock steelhead for many years. In response to the "control" stream designation, the river was last stocked in 1998.

c) Wells Hatchery

Steelhead collected and propagated at Wells Hatchery originated from a mix of indigenous upper Columbia Basin stocks intercepted through the GCFMP. The current stock was developed in the early 1960s from naturally spawning populations intercepted at fish passage facilities upstream of Priest Rapids Dam (MCMCP 1997). Natural and hatchery-origin steelhead are presently collected at Wells Dam as they migrate past the dam. Historically, the program implemented broodstock protocols that targeted mixed-origin (hatchery and wild) fish obtained randomly from the run at large, spaced throughout the entire run time period, with retention of broodstock by proportional return time. In recent years, 5-12% of the steelhead captured have been wild-origin fish. The minimal wild component within the broodstock is a limiting factor in the production of HxW smolt in most years. Pending the outcome of the "Reproductive Success Study", the broodstock collection protocols may target an increased number of wild origin adult for inclusion into the broodstock, thereby increasing the opportunity to produce a larger proportion of HxW parental cross fish for recovery efforts.

Steelhead broodstock will be held and spawned at Wells Hatchery, with progeny used to meet production requirements for the Methow and Okanogan basins. Spawning and mating protocol for the program is detailed in Appendix III. To meet steelhead broodstock requirements, the Wells Dam trap will be operated three days per week, 16 hours per day, from July 8 - November 20. Steelhead carcasses will be used for stream nutrient enhancement, buried on-station or at an appropriate landfill after completion of spawning.

Operation of the Wells Dam trap begins when steelhead arrive at Wells Dam, approximately July 1 and continuing through October and often into early November. The trap operates specifically to meet steelhead broodstock collection requirements (Brown 1997). Trapping will occur 3 days per week on a consistent schedule. Steelhead carcasses will be used for stream nutrient enhancement, buried on-station or at an appropriate landfill after completion of spawning.

d) Methow Basin

Short-term plans call for maintaining the current steelhead supplementation program in this drainage using broodstock secured through Wells Hatchery. In the long term, WDFW intends to establish a local broodstock as a preferred supplementation strategy for the Methow drainage. Prior to meeting this objective, it is necessary to develop a means to effectively secure marked and unmarked steelhead in the Methow River. In the interim, hook and line capture of unmarked fish by qualified anglers may be investigated as a viable means to supplement Methow River broodstock collections.

e) Okanogan Basin

The supplementation program in this basin is currently supported by broodstock collected at the Wells traps. The program will continue to use predominantly Wells stock for the initial efforts at supplementing the wild population. The preferred future strategy will be to shift the current hatchery production originating from Wells into a supplementation recovery effort through the development and use of locally adapted broodstock. Tributary collection sites will be identified and developed within the Okanogan Basin. Qualified anglers may be used to supplement broodstock collections by capturing unmarked steelhead with hook and line, if the traps developed and deployed in these creeks are ineffective. Broodstock collected will be held and spawned at Wells Hatchery. Any localized brood stocking program for Methow and Okanogan origin fish will depend upon availability of separate holding and rearing space at Wells Hatchery.

f) Priest Rapids Dam

Steelhead originating from drainages within the Upper Columbia River Steelhead ESU are routinely collected and sampled through a WDFW-managed program operated in one ladder in the Priest Rapids Dam. The purpose of this program is to collect biological information necessary to assess inseason run size of the upriver-bound steelhead population, hatchery versus wild fish contribution, and brood year contribution. Prior to 1995, fish were collected at Priest Rapids Dam one day per week. The steelhead population passing through Priest Rapids Dam is now trapped and sampled 16 hours per week during the migration. Sub-sampling at 10 to 16 hours per week from 1986-2001 has led to the capture of between 246 and 1,779 adults, or approximately 5-11% of the passing population (K. Truscott, WDFW, pers. comm.). Priest Rapids Dam steelhead stock assessment activities are conducted in the east ladder trap at the dam, using the coded-wire tag (CWT) trapping facility. During 2001, a total 1,779 steelhead were trapped, representing 6% of the projected 2001 adult return past Priest Rapids Dam.

Trapping procedures include collecting of migrants, and holding, anesthetizing, tagging, and handling prior to passage upstream. Because the trap is actively operated, captured steelhead are held for a minimal amount of time in the trap holding area. Fish will be anesthetized in accordance with IHOT (1995) guidelines. External tags may be placed on adipose-clipped fish trapped at this location to identify fish anesthetized with MS-222. External tags are used to prevent retention of these fish by anglers. Scales are collected from captured fish for age analysis. Fish are identified as wild or hatchery-origin through examination for fin-clips, dorsal fin condition, and internal or external tags and marks. Observations regarding gill net or predator marks and general fish condition are also noted. Data collected are used to extrapolate the total

upriver steelhead run size, hatchery and wild fish contribution to the total, and age class contribution. Sampled steelhead are revived and immediately passed upstream.

g) Reproductive Success Study

WDFW will consult with NMFS to develop a study of reproductive success assessing hatchery-origin adult steelhead using DNA micro-satellite technology. Experimental design, stock, and specific objectives have yet to be determined and must also be approved by the Hatchery Committee. Two approaches will be used to examine reproductive success of both Wenatchee and Wells hatchery steelhead.

Due to an extensive upstream migration period and smolts with multiple freshwater age classes, a pedigree approach in the natural system would be logistically difficult. A pedigree approach could be used experimentally using the spawning channel at Wells Dam. Equal proportions of wild, HxH, HxW, and/or WxW adults would be sampled (i.e fin clip) and placed into the spawning channel. Tissue samples would be randomly collected from emergent fry.

Due to the artificial habitat limitations of the spawning channel and duration of the studies (fry versus smolt), an alternative approach could be established in the Methow basin using naturally-produced smolts. Assuming there is a discernable genetic difference between Wells Hatchery-origin stock and wild Methow stock, representative samples of wild smolts could be collected from the lower Methow River using a smolt trap. Collected tissues samples would be analyzed according to parental origin of the juveniles. The proportion wild naturally-produced smolts with hatchery parentage would be compared to the proportion of hatchery adults on the spawning grounds for each respective brood year. For this approach to be successful, it is necessary for a DNA marker to be established for Wells hatchery stock. Analysis of DNA samples collected from previous broodstock would be analyzed before field collections were initiated.

Up to 120 adult steelhead (no more than 50% wild) would be collected from Wells Dam or Dryden and Tumwater dams for experiments in the Wells Fish Hatchery spawning channel to determine egg-to-parr survival rates. Initially, 1,000 tissues samples would be collected from the progeny of these experiments. Additionally, up to 20,000 progeny (actual number would be determined by estimated survival rates) from proposed experiments would be PIT tagged, DNA sampled and subsequently released into respective river basins (i.e. Wenatchee or Methow). Subsequent individual PIT tag detections could occur at the time of emigration (typically 1-3 years) and upon adult return. Tissue analysis would only be conducted on samples from recaptured fish bearing PIT tags. Using PIT tags would allow estimation of individual and group egg-to-parr, parr-to- smolt, and smolt-to-adult survival rates.

Up to 1,000 tissues samples would be collected from naturally-produced juvenile steelhead emigrating from the Methow River. Fish would be anesthetized, tissue and scale samples collected, length and weight recorded. All fish would be released after recovering in fresh water. Analysis of data collected from the Methow River would be similar to that for the Wenatchee River data.

***2. Juvenile rearing, transfers, and releases -***

The objective of the supplementation program is to produce locally-adapted and genetically distinct yearling smolt steelhead of demonstrated readiness for seaward migration. These smolts will be released into appropriate upper Columbia River watersheds. Numbers of fish planted into the individual drainages are based upon the number of smolts required to produce enough returning adults to meet spawning objectives. Scatter-plant releases from trucks promote adult spawning distributions that take advantage of available natural production areas. Future release practices may include acclimation site releases. The current annual production objective is to artificially propagate and release approximately 1,030,000 steelhead smolts in the region at WDFW-managed facilities.

Through the five-year duration of the requested permit, production levels will be reviewed through the Hatchery Committee process. The Hatchery Committee shall meet, at a minimum twice per year or whenever requested by two or more Hatchery Committee members. The Hatchery Committee shall oversee implementation of improvements, monitoring and evaluation elements, and in-season management actions relevant to the hatchery programs as identified in the HCPs, and base their decisions upon: likelihood of biological success, time required to implement and cost-effectiveness of solutions.

WDFW analysis of smolt-to-adult returns have identified numbers of hatchery steelhead smolt releases that may be required to attain natural steelhead spawning targets 80% of the time (Appendix I; Table I-2). Increases in fish production above levels in NMFS Section 10 Permit #1094 may be proposed, depending on funding and availability of hatchery facility space. Effects on the ecological carrying capacity and density-dependent effects of hatchery production to support Upper Columbia River steelhead recovery were considered by NMFS, and such releases were exempted from the overall Columbia River basin production cap (NMFS 1999).

The WDFW management intent for the upper Columbia River steelhead populations is to achieve escapement targets (NMFS 2002). Smolt-to-adult return data analyses indicate supplementation is needed (Table 6; Appendix I Table I-2), based on meeting minimum escapement goals of wild and supplementation steelhead 80% of the time. Table 8 shows production levels estimated to meet the 80% criteria compared to production levels funded through the Douglas and Chelan PUD HCPs, and through state and federal hatchery production. Details regarding adult steelhead spawning protocols are shown in Appendix III. Hatchery-origin upper Columbia River steelhead will continue to be marked according to the representative marking strategy in Table 7. Annual variation in numbers of fish available for release, and annual adjustments in marking needs for on-going evaluation studies, makes it impossible to specify and define the numbers of fish that will be marked with external marks prior to development of annual future brood plans. Annual protocols for broodstocking, marking, and release will be discussed and agreed with NMFS staff as provided in the examples in Appendix III. Signatories to the HCPs will be represented on a Hatchery Committee (Section 8 of: Public Utility District No. 1 of Douglas County et al. 2002,

Public Utility District No. 1 of Chelan County et al. 2002a, 2002b). These committees will discuss and implement adjustments to production levels of supplementation fish at least every five years, in relation to increases or decreases in wild fish escapement. Decisions concerning annual hatchery production and release of supplementation fish will be made in consideration of future run predictions and ocean condition forecasts. Recommendations by the Hatchery Committees concerning appropriate production levels are reviewed and incorporated into fish management plans developed by state, tribal and federal fisheries managers under *U.S. v. Oregon*.

**Table 8.** Production levels of steelhead smolts into waters of the Upper Columbia Steelhead ESU.

| | Wenatchee | Methow-Okanogan | Methow (Winthrop) | Ringold Springs Rearing Facility |
|---|---|---|---|---|
| Smolts required to meet adult escapement requirements /1 | 480,000 | 618,250 | - | - |
| Current Funded Production Levels /2 | 400,000 | 348,858 | - | - |
| Production Levels Funded (Other Source) /3 | | | USFWS Winthrop NFH 100,000 | 180,000 |

1/ Requirement to achieve NMFS escapement targets 80% of the time, based on SAR analyses (Wenatchee River, Table 6; Methow/Okanogan basin, Appendix I Table I-2)
2/ Production levels from Wells, Rock Island, and Rocky Reach Hydroelectric Projects (Public Utility District No. 1 of Douglas County et al. 2002, Public Utility District No. 1 of Chelan County et al. 2002a, 2002b).
3/ Production at Winthrop NFH funded through US Fish & Wildlife Service. Ringold Springs Rearing Facility production through WDFW Mitchell Act funds.

The number of adult steelhead broodstock required to fulfill this production objective assumes a green egg to smolt survival rate of approximately 75% (Table 9). An additional 125,000 eyed eggs will be incubated at Wells Hatchery for transfer to Winthrop NFH. The USFWS facility will produce 100,000 smolts from these eggs for release into the Methow River each year. If the Wells Hatchery program production objectives are met, up to 240,000 eyed steelhead eggs will be provided for RSRF. The eyed-eggs will be initially shipped to the WDFW Klickitat Fish Hatchery and reared to approximately 150 fish/lb, at which time they will be transferred to RSRF to be reared to smolt stage. The Ringold production will be released on-site into the mainstem Columbia River. The Ringold program also rears progeny from the earliest-timed Wells steelhead spawners, allowing the Wells Hatchery spawners that are cultured and released upstream of Wells Dam to coincide with the natural production spawn time.

**Table 9.** Average and median percent survival of juvenile and adult steelhead held at Wells Hatchery, 1996-2001 (WDFW Wells Hatchery unpublished data).

| | Brood Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | Average | Median | Range |
| Fert. to eyed | 82.5 | 89.9 | 85.8 | 75.7 | 84.6 | 86.2 | 84.1 | 85.2 | 75.7 - 89.9 |
| Eyed to smolt | 61.4 | 78.2 | 60.8 | 90.9 | 87.5 | 93.6 | 78.7 | 82.9 | 60.8 - 93.6 |
| Fert. to smolt | 50.6 | 70.3 | 52.1 | 68.8 | 74.0 | 80.7 | 66.1 | 69.6 | 50.6 - 80.7 |
| Pre-spawn | 97.6 | 97.8 | 96.5 | 99.0 | 97.1 | 96.5 | 97.4 | 97.4 | 96.5 - 99.0 |
| Fecundity | 5,410 | 5,167 | 6,878 | 6,103 | 5,451 | 5,639 | 5,775 | 5,545 | 5,167 - 6,878 |
| Male:Female | 0.77:1 | 1.18:1 | 0.55:1 | 0.80:1 | 0.76:1 | 0.89:1 | 0.83:1 | 0.79:1 | |
| Age 1:2-salt+ | 56:44 | 68:32 | 47:53 | 50:50 | 62:38 | 59:41 | 57:43 | 57:43 | |

1996-1999 Fertilization to smolt survival based on female sub-samples and volume/weight estimates.
2000-2001 Fertilization to smolt survival based on 100% fecundity samples of females.

Following are detailed descriptions of juvenile steelhead rearing, transfer, and release activities proposed for each WDFW facility. Included are target smolt production levels, based on desired broodstock collection goals and average green egg-to-smolt survival rates. Based on 1998 brood results at Wells Fish Hatchery, actual numbers of smolts produced and transferred from each hatchery may vary by as much as 10% from the estimated annual totals provided below, due to annual variances in fecundity, and egg and juvenile survival rates.

Methow/Okanogan Steelhead Program

Wells Hatchery -

Production of listed juvenile steelhead at Wells Hatchery totals approximately 450,000 smolts per year. In addition, eyed eggs are transferred from Wells for fish production at Winthrop NFH and RSRF, which are federally-funded hatcheries. During April and May, after 12-14 months of rearing, smolts at a size of approximately 6 fish per pound are outplanted from Wells Hatchery. To ensure steelhead destined for outplanting are smolted and ready for seaward migration, smolts that are volitionally-released are collected in ponds below the rearing raceways. Collected smolts are then truck-planted at designated release locations. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies reduces the incidence of diseases in fish produced and released from Wells Hatchery.

Steelhead smolts reared at Wells Hatchery are scatter-planted into three upper Columbia watersheds. The current program calls for the release of up to 320,000 smolts in the Methow River, and 130,000 smolts into the Okanogan River basin, which includes the Okanogan and Similkameen rivers, and Salmon and Omak creeks. Fish are released at several sites within each watershed to minimize ecological impacts on juvenile wild salmonids that might result from

outplanting large numbers of fish at a single location, and to foster widespread distribution of returning adult spawners across available habitat.

The program will target 100% HxW progeny for recovery in the Methow River Basin, consistent with smolt production required to meet adult escapement provided by the historical range of smolt-to-adult survival for the Wells stock and as determined by broodstock origin composition. Sixty-two percent of brood year 2000 and 70% of brood year 2001 smolts planted from Wells Hatchery into the Methow River were the progeny of HxW adult crosses accessed through broodstock trapped at Wells. This program may shift to using Methow wild broodstock for future outplants. Steelhead smolts planted into the Okanogan watershed are presently progeny of Wells HxH crosses, but HxW or WxW smolts (Okanogan wild source, if available) may be used in future years. All steelhead released into the Methow and Okanogan River will be given an external mark unique to parental origin.

Wenatchee Steelhead Program

The production objective for the Wenatchee River watershed is to release approximately 400,000 steelhead smolts into natural production areas. Smolt production will utilize combined facilities of Wells Hatchery, Chelan Falls Hatchery, Turtle Rock Hatchery and the Chiwawa River Acclimation Ponds. The smolt production for the Wenatchee River basin will prioritize HxW and WxW parental crosses, to the extent practicable, as determined by broodstock origin composition, to maximize use of wild fish collected from the Wenatchee while fostering inclusion of locally adapted traits carried by hatchery fish. Given the spawn timing differences between hatchery and wild origin steelhead comprising the Wenatchee stock, it is likely that HxH parental crosses will occur in addition to the priority HxW and WxW parental crosses. All steelhead released into the Wenatchee River will be given an external mark unique to parental crosses and brood year (Table 7).

All fish planted will be marked with visual implant elastomer tags to allow identification of returning hatchery-origin adults. At current production levels, and with current marking protocols specific to the broodstock evaluation program, it is not expected that hatchery-origin steelhead smolts will be adipose-clipped prior to release in the Wenatchee system. In the event that evaluation of smolt survival rates indicates that it is appropriate to release a greater number of smolts, and in the event that funding and facility resources are available, then the Hatchery Committee may recommend the release of adipose-marked steelhead smolts into the Wenatchee River.

a. Chelan Hatchery/Turtle Rock Hatchery -

Currently, the Wenatchee Program holds adults at Wells Hatchery because Wells Hatchery has cooler well water than does Eastbank Hatchery. Gametes are collected at Wells Hatchery and transferred to Eastbank Hatchery where fertilization occurs. Eggs from the latest spawning Wenatchee River steelhead are transferred to Chelan Falls Hatchery for the majority of incubation and rearing (through October) to facilitate increase growth, in an effort to equalize the size-at-release of steelhead smolts from early and late spawn fish. At full program production, 200,000

fish (HxW and WxW) will be reared at Chelan Falls Hatchery until October-November, at which time they will be transferred to Turtle Rock Hatchery or Chiwawa acclimation ponds for final rearing. The transfer of fish to Chiwawa acclimation ponds depends upon space availability, relative to spring chinook production requirements. Steelhead at Turtle Rock Hatchery are scatter-planted directly from the Turtle Rock facility to the Wenatchee Basin and into best available spawning and rearing habitats, above Tumwater Dam (including tributaries). Steelhead reared at the Chiwawa facility are volitionally released into the Chiwawa River.

Through this combined program, approximately 200,000 steelhead smolts, at a size of 6 fish per pound following 12 to14 months of rearing, are produced for release during April and May each year. Details of fish propagation practices at Chelan and Turtle Rock hatcheries, including disease control procedures, are provided in operations plans presented in Appendix I. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released. Fish health management programs affecting all stocks at the facilities are detailed in Appendix I, under "Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques."

b. Eastbank Hatchery -
Eastbank Hatchery is located adjacent to Rocky Reach Dam. Gamete collection and fertilization for the Eastbank program is identical to the Chelan Falls Hatchery/Eastbank Hatchery program. Eggs from earlier spawn steelhead are retained at Eastbank Hatchery and reared until October-November at which time they are transferred to Turtle Rock or the Chiwawa River Acclimation Ponds for final rearing. The smolts are either scatter-planted from Turtle Rock into the best available spawning and rearing habitats in the Wenatchee River or volitionally released from the Chiwawa River Acclimation Ponds during April or May each year. An annual target of approximately 200,000 smolts (HxW and HxH) are planted after 12 to 14 months of rearing to a size of 6 fish per pound.

Details regarding fish propagation practices at Eastbank Hatchery, including disease control procedures, are provided in operations plans presented in Appendix I. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released. Fish health management activities are detailed in Appendix II, under "Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques."

d. Ringold Springs Rearing Facility
If Wells Hatchery program production objectives are met, approximately 240,000 eyed eggs will be transferred from Wells Hatchery to RSRF via Klickitat Fish Hatchery. This strategy maximizes flexibility in removing the earliest spawning steelhead from the Wells stock, thereby reducing the potential to artificially shift the natural spawn and run timing, and to minimize perpetuating early spawn timing in hatchery-origin fish at Wells. This transfer will produce up to 180,000 smolts to

be released on-site at the RSRF. The adipose and ventral fins of the smolts will be clipped to identify them as fish belonging to the Ringold steelhead population.

The level of 240,000 eggs is based upon recent year (1999-2001) fertilized egg-to-smolt survival rates for Wells Hatchery steelhead of approximately 75% (Table 9). This survival rate will be reviewed by the Hatchery Committees annually to determine modifications in egg transfers to RSRF.

***3. Disposition of Excess Returning Adults -***

Wells Hatchery steelhead were initially identified as "essential for recovery" during the ESA review process. Since that time, there has been a documented abundance of hatchery-origin fish, resulting in a desire for a balance between wild spawners and supplementation activities using hatchery stocks. When adequate outmigration, favorable ocean survival conditions, and minimal pre-terminal adult mortalities result in ample returns of adult steelhead, it is desirable to actively balance the proportions of spawning wild and hatchery-origin fish. When sufficient numbers of steelhead have passed above Priest Rapids Dam to meet the established escapement goals for natural spawning and hatchery egg-take needs, those hatchery-origin steelhead that are excess to the escapement needs may appropriately be removed from the system without jeopardizing the recovery of Upper Columbia River Steelhead ESU. Under those circumstances, WDFW intends to maximize the proportion of naturally-spawning wild and supplementation upper Columbia River steelhead, and to reduce the numbers and proportion of naturally-spawning listed hatchery-origin steelhead.

If smolt production objectives, in-river migration conditions, ocean rearing conditions or other conditions that affect smolt to adult survival are favorable, the number of returning adults may exceed the number required to meet escapement and broodstock collection objectives. If this situation arises, several strategies may be employed to address excess adult returns, including removal through authorized fisheries and removal at dam or hatchery facility fishways.

There is no identified natural spawning of upper Columbia River steelhead in the mainstem Columbia River below Priest Rapids Dam. More adult steelhead generally return to the RSRF than are needed for recovery and supplementation requirements. Marked hatchery-origin adult steelhead beyond recovery and supplementation needs will be removed at the RSRF and through authorized recreational fisheries. A harvest fishery, with bait allowed, for adipose fin-clipped and/or adipose and ventral fin-clipped steelhead (wild steelhead release rules) will occur below Priest Rapids Dam in the downstream portion of the Hanford Reach from September 16 through March 31. The starting date of this fishery may be postponed until October 15, depending on pre-season and/or in-season evaluation of steelhead run size to minimize adverse impacts to upstream-migrating fish. A harvest fishery, with bait allowed, for adipose and ventral fin-clipped steelhead will occur at the RSRF site from September 16 through June 15.

The escapement requirement is 6,950 naturally-spawning steelhead above Priest Rapids Dam (NMFS 2002) (Table 4). To achieve the 6,950 escapement target minimum, 8,300 fish must past Priest Rapids Dam to account for inter-dam and over-wintering mortalities (Appendix IV).

An in-season decision to remove hatchery-origin steelhead above Priest Rapids Dam that are surplus to spawning and recovery needs will be made only if the Priest Rapids Dam run size estimate indicates a surplus of hatchery steelhead (adipose-clipped and adipose + ventral fin-clipped) and assures that natural spawning objectives will be met. Removals of excess hatchery-origin steelhead will be structured to have minimal impact on wild and supplementation fish

Steelhead originating from the Upper Columbia River Steelhead ESU are routinely collected and sampled by a WDFW monitoring program operated in one ladder of Priest Rapids Dam. The purpose of this program is to collect biological information that will enable an in-season run size assessment, hatchery and supplementation versus wild fish ratio, and brood year contribution. Prior to 1995, fish were collected at Priest Rapids Dam 10 hours per week. The steelhead population passing above Priest Rapids Dam is currently trapped and sampled 16 hours per week during the migration. Sub-sampling 10 to 16 hour per week has captured between 246 and 1,779 adults, or approximately 5-11% of the passing population (1986-2001 range from Kirk Truscott, WDFW, pers. comm.).

Trapping procedures include collecting, holding, anesthetizing, and handling adult migrants prior to passage upstream. Because the trap is actively operated, captured steelhead are held for a short time in the trap holding area. Fish are anesthetized in accordance with IHOT (1995) guidelines. Scales are collected for age analysis and fish are identified as to wild or hatchery origin. Any observations regarding gill net or predator marks are also noted. Data collected are used to extrapolate the total upriver steelhead run size, hatchery, supplementation and wild fish components, and age class determination. Sampled steelhead are then immediately revived and passed upstream. In 16 years of operation, WDFW personnel have experienced no mortalities of adult steelhead collected for this program at Priest Rapids Dam (L. Brown, A. Viola, K. Truscott, WDFW, pers. comms.). It is believed that trapping and sampling at Priest Rapids in future years is unlikely to lead to the immediate mortality of listed steelhead. Stress, descaling and possible injury to captured fish is possible, which may lead to unknown levels of delayed mortality or decreased potential for successful spawning.

Based on in-season monitoring of steelhead passage at Priest Rapids Dam between early September and October 1, WDFW will have the opportunity to determine whether the removal of excess marked hatchery steelhead above escapement requirements will benefit the wild run steelhead above the project. Historically, peak steelhead migration over Priest Rapids Dam occurs the second week of September and 87% of the run is over the dam by September 30 (L. Brown, WDFW, pers. comm.). If removal of excess hatchery steelhead is warranted, a recreational harvest fishery for adipose-clipped and adipose + ventral fin clipped steelhead will be allowed through emergency regulation, from October 1 through March 31, on the Similkameen,

Okanogan, Methow, and mainstem Columbia rivers. Excess marked hatchery fish may also be removed at the Wells Dam hatchery for placement in local lakes or ponds for recreational opportunity.

When runs of Upper Columbia River ESU steelhead are determined to be of sufficient size, it is desirable to balance the wild/supplementation and hatchery components in the basin through active management. Excess hatchery-origin steelhead may also be removed through trapping at hatchery facilities or fishways or during authorized sport fisheries. Population estimates for the three steelhead groups (HxH, HxW, and WxW) will be taken into account, but only the hatchery component of the run (adipose-clipped and adipose + ventral fin-clipped) would be removed from the system.

Hatchery-origin steelhead, excess to broodstock and recovery needs, which are removed from hatchery facilities, traps, and fishways, may be relocated to lakes and ponds to provide recreational opportunity. The selection of lakes that may receive steelhead from this trap-and-haul activity will be coordinated between WDFW Regional Fish Program staff and the WDFW Hatchery Program Fish Health specialists to ensure adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies. Criteria to be considered in this selection process include disease containment, assurance that fish will not compete or spawn with naturally-spawning steelhead, and that the location is accessible to recreational anglers.

**a. Removal at Hatchery Facilities & Fishways**

**i. Wells Dam Trap**

Hatchery facility removal of excess Wells stock steelhead may occur at the trap at Wells Dam in the course of broodstock collection and during activities associated with assessment of Wells Hatchery steelhead production group survival. Wells stock broodstock collection and survival assessment consists of trapping 3 days per week, 16 hours per day. Upon meeting the weekly quota for broodstock collection, the trap continues to operate and capture steelhead for survival assessment. Adipose-clipped steelhead may be removed from the population during the assessment activities and released to lakes or ponds where they cannot emigrate back into the Columbia River system and compete with naturally-spawning steelhead. This action minimizes potential negative impacts to recovery efforts above Wells Dam. Based on 1999-2001 Wells Dam data, approximately 37% of the total steelhead passage at Wells Dam may occur in the west ladder. Broodstock and stock assessment data (brood years 2000-2002) indicated that approximately 17.5% (range 14.7- 25.2%) of the total passage at Wells Dam west ladder may be expected to be trapped and handled. The proportion of the total steelhead passage expected to be trapped at the west ladder, is approximately 6.5% (.37 x .175 = .0647), of which a portion will be excess to broodstock needs and could be removed from the population.

The number of steelhead potentially removed will vary and largely depend upon the size, origin, and composition of the adult return. The extent of trap and haul operations will depend upon WDFW funding and staff availability constraints. If removal at the Wells Dam ladder is required, removal would be conducted in conjunction with broodstock trapping. Removal would occur no earlier than September 15, when the earliest preliminary steelhead run size estimate can be determined at the 50% passage date at Priest Rapids Dam.

**ii. Ringold Springs Rearing Facility**

Removal of excess Wells-stock steelhead at the RSRF may occur at the fish trap located at the facility. Thereafter, based on the number of steelhead returning to the RSRF trap, collections of adipose-and-ventral fin absent steelhead may continue and the fish released into lakes or ponds where they cannot emigrate back into the Columbia River and compete with naturally-spawning steelhead. The number of steelhead potentially removed will vary and largely depend upon the size, origin, and composition of the adult return. The extent of trap and haul operations will depend upon WDFW funding and staff availability constraints. Removal of the fish will minimize potential negative impacts of HxH adults on recovery efforts.

The stress to the steelhead being removed at these facilities will be no more than what currently takes place for steelhead captured/examined and released during the currently-authorized activities to assess Wells Hatchery steelhead production group survival rates.

**b. Recreational Fishery Option**

WDFW has identified the use of recreational fisheries, selective for adipose-clipped and adipose + ventral fin-clipped hatchery steelhead, as the most effective method to remove hatchery-origin steelhead that are excess to recovery and broodstock requirements. This method has the greatest potential to reduce the numbers and proportion of excess hatchery-origin steelhead spawning with wild or supplementation fish in the upper Columbia River Steelhead ESU area.

If the run size of steelhead in the ESU is documented at Priest Rapids Dam to be sufficient to meet escapement objectives, and to meet hatchery broodstock needs, recreational steelhead fisheries would take place in waters above Priest Rapids Dam. The intent of the fisheries is to reduce the numbers and proportions of hatchery steelhead in the naturally-spawning population. A recreational fishery will occur annually in the Hanford Reach area to reduce the numbers of hatchery steelhead that are surplus to broodstock requirements.

***i. Areas above Priest Rapids Dam***

WDFW will estimate in-season run size and composition at Priest Rapids Dam. These data will be entered into a model (Appendix IV) that estimates the impact of recreational fisheries on marked, supplementation and wild origin fish for each watershed above Priest Rapids Dam. If the in-season run size estimate at Priest Rapids Dam indicates the numbers of returning Upper Columbia steelhead will exceed recovery and broodstock needs, and the removal of surplus

adipose-clipped and/or adipose + ventral fin-clipped steelhead is warranted, recreational steelhead fisheries will occur on the Methow, Similkameen, and Okanogan rivers, and the mainstem Columbia River. Exceptions to the harvest of marked hatchery-origin steelhead will be on those adipose-clipped steelhead containing external tags. External tags may be placed on adipose-clipped fish trapped at Priest Rapids Dam to identify fish anesthetized with MS-222, a measure designed to prevent retention of these fish by anglers.

If the wild run size is predicted to be less than 1,300 (application of 1992-2001 10-year average wild composition [Table 1] of 15.4% to the escapement objective of 8,300, as measured at Priest Rapids Dam), no fisheries will occur regardless of total steelhead run size. If the wild run size is predicted to be greater than 1,300 and the total run size is predicted to be greater than 9,550, WDFW would open a recreational fishery allowing anglers to retain one hatchery steelhead per day. If the wild run size is predicted to be greater than 1,300 and the total run size is predicted to be greater than 10,035, WDFW would open a recreational fishery allowing anglers to retain two hatchery steelhead per day (Table 10). The fisheries would be open from September 16 through March 31, by emergency rules.

When the total abundance of Upper Columbia River Steelhead ESU expected to pass above Priest Rapids Dam is greater than 8,300 but less than 9,550, and a wild run size of 1,300 fish is predicted, the model presented in Appendix IV will be run to determine numbers of steelhead escaping to the individual tributaries. If numbers of adult HxH steelhead expected to return to the Methow or Okanogan/Similkameen are present in numbers significantly greater than those necessary for recovery and supplementation, WDFW will consult with NMFS to determine whether a recreational fishery is warranted to reduce the numbers and proportions of hatchery steelhead on the spawning grounds, as well as the duration and areas to be opened, and appropriate levels of monitoring.

If a fishery directed on excess hatchery-origin steelhead were authorized, bait would be allowed in the mainstem Columbia River above Priest Rapids Dam. The use of bait would be allowed to maintain consistency and standardization of regulations between this fishery and fisheries for non-listed species, as authorized in Section 10 Permit 1248.

Tributary (Methow, Similkameen, Okanogan, Wenatchee, rivers) fisheries would open under "selective gear rules." Selective gear rules are defined as, "only unscented artificial flies or lures with one barbless single hook, bait is prohibited; fish may be released until the daily limit is retained. No one may fish from any floating device equipped with a motor. If any fish has swallowed the hook or is hooked in the gill, eye, or tongue, it should be kept if legal to do so." Regulations requiring the release of wild steelhead (Wild steelhead may not be kept; only hatchery steelhead may be kept. Hatchery steelhead are defined by a missing adipose or ventral fins and a healed scar in the location of the missing fin.) would be in place on all waters.

Above Priest Rapids Dam, steelhead fishing areas that may be opened by emergency regulation are:

a) Similkameen River - from mouth to Enloe Dam.
b) Okanogan River - from mouth upstream.
c) Methow River - from the second powerline crossing upstream of the mouth (Highway 97 bridge) upstream to the mouth of the Chewuch (Chewack) River, above the town of Winthrop.
d) Mainstem Columbia River - from Priest Rapids Dam to Chief Joseph Dam.

Based upon analysis of SAR in Wenatchee, WDFW may propose, through the Hatchery Committee process, to adipose-clip a portion of steelhead smolts released in the system; a recreational fishery may be authorized on returning adult steelhead using the same criteria as are used in the Methow/Okanogan system to identify returning hatchery-origin adult steelhead that may return in numbers in excess of recovery and broodstock needs. Any recreational fishery proposed on the Wenatchee River would take place from its mouth to the Highway 2 bridge at Leavenworth, targeted on adipose-clipped fish.

**Table 10.** Upper Columbia steelhead prediction model illustrating expected spawning escapements, hooking and sport harvest mortalities, and proportion of hatchery and wild/supplementation fish on spawning grounds at minimum harvest and run size levels, using historical wild, unmarked hatchery/supplementation, and marked hatchery fish proportions, above Priest Rapids Dam.

| Min. Run Size Total | # Wild 16% | # Suppl. 34% | # Hat. 50% | Proposed Fisheries | Hooking Mortality | | Sport Harvest | Total Escap. | Percent into Escapement | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Wild | Suppl. | | | Wild + Suppl. | Hat. |
| 8,300 | 1,328 | 2,822 | 4,150 | Consult NMFS | 0 | 0 | 0 | 6,953 | 50 | 50 |
| 9,550 | 1,528 | 3,247 | 4,775 | 1 Fish/day | 19 | 41 | 1,194 | 6,950 | 57 | 43 |
| 10,035 | 1,606 | 3,412 | 5,018 | 2 Fish/day | 26 | 56 | 1,656 | 6,950 | 59 | 41 |
| 10,835 | 1,734 | 3,684 | 5,418 | 3 Fish/day | 39 | 61 | 2,438 | 6,951 | 64 | 36 |
| 12,115 | 1,938 | 4,119 | 6,058 | 4 Fish/day | 58 | 124 | 3,635 | 6,952 | 71 | 29 |

The model contains all elements required to estimate hatchery steelhead harvest numbers, hooking mortality to wild and supplementation fish, and identifies proportions of hatchery and wild/supplementation fish on the spawning grounds over a range of run sizes. A series of hypothetical run size and stock composition data are displayed in the model as representative upper Columbia River steelhead escapements at varying management scenarios. With the desire to limit the number of adipose-clipped fish on the spawning grounds, this tool provides valuable information to justify hatchery steelhead harvest.

If recreational steelhead harvest fisheries are deemed warranted, a model-derived representation similar to Table 10 (Appendix IV), using estimates from in-season sampling at Priest Rapids Dam, of wild, non-adipose clipped supplementation, and adipose-clipped hatchery steelhead from will be prepared annually to estimate hooking mortality impacts and harvest of adipose-fin clipped steelhead.

***ii. Areas below Priest Rapids Dam***

- Hanford Reach

If the run of Upper Columbia River Steelhead ESU is estimated from sampling at Priest Rapids Dam to attain a minimum size of 8,300 fish, a harvest fishery, with bait allowed, for adipose fin and ventral fin-clipped steelhead (wild steelhead release rules) will occur below Priest Rapids Dam in the downstream portion of the Hanford Reach (from the U.S. Highway 12/395 Bridge at Pasco upstream to the Old Hanford Townsite wooden powerline towers, a distance of 32 miles), from September 16 through March 31. If the steelhead run passing Priest Rapids Dam is not expected to attain the minimum 8,300 fish, the fishery in the Hanford Reach area will be postponed until October 15 to ensure that steelhead bound for areas above Priest Rapids Dam have cleared the area. All unmarked wild and supplementation fish will be released and only hatchery fish with an adipose + ventral fin-clip could be retained.

Based on the 1990-1999 average, 88% of Upper Columbia ESU wild and hatchery steelhead pass Priest Rapids Dam by the end of September. The upstream boundary of the area to be opened for the Hanford Reach hatchery steelhead fishery is 35 miles downstream of Priest Rapids Dam. WDFW estimates that more than 50% of the steelhead that pass Priest Rapids Dam after September 30 will be upstream of the area open to this fishery by October 1. Consequently, approximately 6% of the wild and hatchery steelhead destined to pass Priest Rapids Dam are susceptible to capture in this sport fishery - virtually all during the first two weeks of October (J. Easterbrooks, WDFW, pers. comm.). This impact will drop to near zero if the fishery is opened October 15 due to a low up river run size estimate.

b) Ringold

A harvest fishery, with bait allowed, for adipose + ventral fin-clipped steelhead (wild steelhead release rules) will occur below Priest Rapids Dam in the area adjacent to RSRF (in Franklin County north of Pasco, Washington) from the WDFW markers a quarter mile downstream of the Ringold irrigation waste way outlet to the markers upstream of the Spring Creek hatchery outlet. This bank fishery is restricted to the RSRF side of the river, from October 1 through June 15 of the following year. The June 15 end date should avoid impacts to migrating Upper Columbia adult steelhead returning in the subsequent year's migration. Based on sampling of recreational fisheries in the restricted RSRF area, we expect little to no impacts to fish bound for areas above Priest Rapids Dam.

## V. Description of the Purpose of the Proposed Program:

The purpose of the proposed program is to assist in sustaining and recovering the listed upper Columbia River basin steelhead populations by implementing a live trapping, propagation, and transplantation program using indigenous broodstock. The removal of hatchery-origin upper Columbia River steelhead that are excess to recovery and broodstock needs is necessary to increase the proportions of wild and supplementation steelhead spawning naturally. Further details regarding the purpose of the program are provided in section IV.A. above.

***A. Detailed discussion of procedures and techniques***.
A detailed discussion of the procedures and techniques which will be used during the program is provided in sections IV.B. and C. above.

***B. Risk/benefit analysis for the Hatchery Program in the Upper Columbia River.***
In 1997, M. H. Schiewe of the NMFS (Schiewe 1997) conducted an analysis of the risks and benefits of the proposed actions to Upper Columbia ESU steelhead during a review of a direct take permit application from WDFW for Upper Columbia steelhead. Below is a summary of the issues identified in the risk/benefit analysis.

Risks -
The risks identified for the proposed actions include loss of within and among population genetic diversity, lower productivity due to hatchery effects, hatchery fish masking health of natural populations, and ecological interactions of hatchery and natural fishes (Schiewe 1997). Artificial spawning and rearing of steelhead may lead to genetic divergence between hatchery and natural fish which increases the risk of deleterious effects on natural populations and decreases the usefulness of the hatchery program for recovery. If future hatchery spawning, rearing, and release protocols are carefully developed and monitored, deleterious effects of the hatchery program on wild populations should be reduced.

The proposed actions pose risk to Upper Columbia ESU steelhead population diversity. Diversity within the hatchery population may have declined as a result of deliberate selection for early spawning hatchery fish (Schiewe 1997). In general, adult steelhead reared in hatcheries are held in warmer water under lighted conditions to accelerate maturation. At Wells Hatchery, fish are held in a covered pond with reduced natural light (H. Bartlett, WDFW, pers. comm.). Natural fish taken into the hatchery and held under the same conditions mature later, but are given hormonal injections to accelerate maturation and facilitate spawning between the groups. Hatchery conditions in which adult steelhead are held for maturation should resemble the natural environment as close as possible. The WDFW has developed spawning protocols to promote spawn timing in the hatchery population which more closely resembles that of fish in the wild (Brown 1997).

Loss of among population diversity may also occur from the proposed actions. Broodstock collected at Wells Dam may be a mixture of Methow and Okanogan basin populations. Offspring are scatter-planted into the Methow and Okanogan basins. These actions, along with the high percentage of hatchery fish on the spawning grounds, pose risks to population diversity. The WDFW is developing methods to collect broodstock from the Wenatchee River basin which will promote a locally adapted hatchery fish (A. Viola, WDFW, pers. comm.). In addition, smolt acclimation facilities are being considered to promote increased homing fidelity (MCMCP 1997). Currently, the appropriate percentage or number of hatchery fish that should be allowed on the natural spawning grounds has not been determined (Schiewe 1997), partially because there is uncertainty as to the reproductive success of hatchery fish spawning in the wild.

Benefits -
The benefits identified for the proposed actions include increased abundance leading to lower risk of extinction or enhanced recovery, increased nutrient supply from additional spawners, and research that will benefit the conservation of natural populations. Previous data from the Wells Hatchery program indicate that adult-to-adult survival of artificially propagated steelhead is higher than observed for natural steelhead (Schiewe 1997). The survival benefit provided by artificial propagation can potentially reduce the risk of extinction of the Upper Columbia ESU steelhead. Natural steelhead can also benefit from increased nutrient supply to the stream environment from additional hatchery fish spawning and dying in the wild. The WDFW (Brown 1997) and Mid-Columbia Mainstem Conservation Plan (MCMCP 1997) have established a monitoring program and research projects to provide more information on the reproductive success of hatchery fish. In addition, a more locally-adapted broodstock and enhanced hatchery adult homing techniques are currently being developed.

Conclusions -
Based on available information, Schiewe (1997) concludes that the proposed actions are likely to provide a net benefit to Upper Columbia ESU natural steelhead as long as dam related mortalities remain high. However, he and NMFS believe the risks and benefits analysis of the proposed actions should be re-evaluated when additional information is obtained.

***C. Potential for injury or mortality and steps taken to minimize adverse effects.***
Details regarding the potential for injury or mortality of listed steelhead by life stage associated with each activity are presented in section VI. below, which addresses anticipated take levels.

Steps to be taken to minimize adverse effects on listed steelhead are presented in the following sections, which detail impact minimization, mitigation, and monitoring actions.

1) **Impact Mitigation, Minimization, and Monitoring**.

***a. General Impact Mitigation and Minimization Measures*** -
The "take" of Upper Columbia steelhead that is requested for authorization through this permit will result from artificial propagation efforts designed to benefit the species. A primary objective of these efforts is to foster local adaptation of tributary stocks. Attendant with this objective is the recognition that adverse ecological and genetic changes to the propagated steelhead must be minimized to retain and foster the unique characteristics needed to effectively supplement the natural populations. Specific actions are proposed to mitigate and minimize any adverse ecological and genetic effects on listed upper Columbia River steelhead and spring chinook. These actions will include:

- producing and releasing smolts only, with demonstrated preparedness for downstream migration, through fish culture and volitional release practices, fostering rapid seaward migration with minimal rearing or delay in the rivers;
- scatter-planting hatchery steelhead smolts in the best available spawning habitats to minimize ecological interactions with wild fish that might result from single point mass releases and to promote spawning distributions that take advantage of natural production;

- fostering local adaptation at the watershed level by incorporating adults indigenous to the watersheds into hatchery broodstock used for the supplementation program;
- mass-marking all hatchery steelhead released to allow for monitoring of hatchery fish migration, fisheries contribution, and survival, and to allow for ready differentiation between hatchery and wild fish at adult return;
- constructing and using acclimation ponds within each watershed, if analysis shows that spawner distributions and survival rates for acclimated fish are improved over those for scatter-planted fish;
- complying with IHOT (1995) guidelines regarding fish health, genetics, local ecological interactions, hatchery practices, and hatchery operations to maintain healthy hatchery and wild salmonid populations;
- complying with Pacific Northwest Fish Health Protection Committee disease prevention and control standards to minimize the risk of disease transference to natural fish;
- consistently achieving hatchery effluent and best management practice standards set forth in National Pollutant Discharge Elimination System (NPDES) Permits to avoid adverse affects on wild fish and their habitat; and
- adhering to the annual hatchery production levels that were in place when NMFS established a basin-wide production ceiling (NMFS 1995) to address ecological carrying capacity concerns in the migration corridors, the estuary, and the marine ecosystem, and to minimize over-all density-dependent effects of hatchery production on listed species.

**b.** ***Impact Minimization and Mitigation Measures by Proposed Activity -***

1. Broodstock Collection and Adult Returns -

All trapping operations will be conducted consistent with broodstock collection protocols developed for each program. These protocols specify numbers and timing of fish collections at each trapping location. All steelhead encountered in hatchery operations will be held for a minimal duration in traps. Wild steelhead that are trapped in excess of removal goals will be released upstream immediately without harm. Delay in migration and stress to steelhead encountered will be minimized through these actions.

Transferred fish will be scatter-planted into the best available spawning areas to promote adult spawning distributions that take advantage of natural production. Steelhead with wire tags and/or external marks will continue to be evaluated with regard to fisheries contribution, homing, and survival. Adult collection methods for these complexes are further explained in appended operations plans (Appendix II).

2. Juvenile rearing and releases -

Rearing and release strategies are designed to limit ecological interactions between hatchery and naturally produced fish. Fish are reared until smoltification has occurred within nearly the entire population, which reduces residence time in streams following release (Bugert et al. 1991). To indicate when fish should be allowed to volitionally migrate, physiological measures of the degree of smoltification within the hatchery population, including allowable fork length coefficient of variation maximums (CV less than 10%) and average condition factor at release targets (0.9 - 1.0) will be used.

In the upper Columbia River region hatcheries, smolts that volitionally migrate from rearing ponds are trapped and collected from holding ponds located at the base of rearing ponds for outplanting to the watersheds. This practice allows unsmolted fish to continue to feed and develop for eventual outplanting when they volitionally leave the rearing ponds. The practice of collecting and outplanting only volitionally-migrating fish leads to the rapid downstream dispersal of steelhead from the release sites. Volitional releases, in combination with scatter-planting, also act to reduce instantaneous densities of hatchery-reared fish in wild fish production areas, reducing potentially adverse density-dependent effects.

Through these practices, smolts will migrate seaward without delay, minimizing interactions with listed wild steelhead juveniles and smolts that rear in and/or migrate through freshwater and estuarine areas. In addition, smolt releases will continue to be timed with water budget releases from upstream dams, to further accelerate seaward migration of released hatchery fish and reduce the duration of any interactions with wild fish. On-station rearing of hatchery steelhead on parent river water in the upper Columbia region will also contribute to the smoltification process leading to reduced hatchery fish residence time in the rivers and mainstem migration corridors.

Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released. Fish health management programs affecting all stocks, and fish health activities specific for each complex, are detailed in Appendix II, under "Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens." Appendix II provides further detail for each hatchery facility regarding methods used to minimize interactions and effects on other fish populations through proper rearing and release strategies.

3. Habitat actions -

Hatchery effluents currently meet NPDES requirements. Practices required at the WDFW hatcheries to protect water quality will help ensure continued compliance with permit criteria, minimizing the likelihood for adverse effects on listed steelhead in tributaries. High dilution factors in the lower Columbia mainstem migration corridor reduce the likelihood for any adverse effects on wild salmonid populations in the lower river or in the Columbia estuary. Further detail regarding effluent monitoring and impact minimization is provided in Appendix II, Objective 5: "Conduct environmental monitoring."

4. Removal of excess hatchery-origin adults -

i. Removal at hatchery facilities and fishways will improve the balance of wild, supplementation and hatchery fish arriving on the spawning grounds. The stress to individual steelhead being removed will be no more than what currently occurs when steelhead are captured, examined, and released during the currently-authorized activities to assess Wells Hatchery steelhead production group survival rates, or for those fish removed from the RSRF.

ii. Removal by recreational fisheries

A literature review by Rawding (2000) of hooking mortality on wild steelhead indicates that adults caught during winter conditions (in cool [<50°F] water), including those caught with bait, sustain hooking mortalities of 1.1%, while year-round fisheries sustained a hooking mortality of 3.7%. We assumed a conservative 5% mortality for adult steelhead caught in upper Columbia River fisheries from September through March.

Actions that will be employed to minimize impacts to wild and supplementation steelhead which will be encountered by anglers during the recreational fishery include the mandatory release of steelhead that possess an adipose fin (above Priest Rapids Dam) or adipose and ventral fins (at the RSRF). Selective gear regulations will be in effect for fisheries authorized in the tributaries. WDFW provides information on wild fish release requirements and selective gear regulations in the annual Washington Sport Fishing Rules pamphlet, in periodic media news releases, and by signs posted in the fishing areas. Enforcement of these regulations is conducted primarily by the WDFW Enforcement Program conducting periodic random and special emphasis patrols.

Steelhead fishery management by WDFW will not appreciably reduce survival and recovery of the Upper Columbia River Steelhead ESU because:

- fishery timings are established to protect important spawning and outmigration periods,
- fisheries are 100% selective for hatchery-origin HxH steelhead,
- unmarked steelhead must be released, unharmed, back into the water,
- sanctuary areas have been established in the tributary basins to protect important production areas, and
- gear restrictions will be imposed on fisheries in the tributary waters to further reduce impacts to wild and supplementation fish and improve survival of incidentally-hooked fish.
- fisheries would only occur when managers have assurance that the abundance of returning adult upper Columbia River steelhead is sufficiently high to meet escapement objectives and achieve hatchery broodstock goals.

***c. Monitoring and Evaluation -***

1. General actions

A well-defined monitoring and evaluation plan is proposed to ensure that impacts to the natural steelhead population are minimized. The basic features of individual plans for each upper Columbia River hatchery facility are presented in Appendix II. The operational plans included in Appendix II report procedures used to minimize impacts on wild fish and evaluate outcomes of hatchery practices through performance standards (IHOT 1996). The plans are updated, and the performance of each hatchery in meeting production objectives are evaluated on a biennial basis. Operational practices, objectives, and steelhead production information for each facility are presented in Appendix II as follows:

***Hatchery Operations Plans -***

**Facility Name -**

**Facility Purpose -**

**Facility Goals -**

**Facility Objectives** - Descriptions of desired objectives for propagating healthy hatchery populations and to minimize effects on wild fish and their habitat are presented. These objectives include the following:

1. **Hatchery Production -** (define permitted and agreed annual production levels that are not to be exceeded for each species)
2. **Minimize interactions with other fish populations through proper rearing and release strategies.**
3. **Maintain stock integrity and genetic diversity.**
4. **Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens.**
5. **Conduct environmental monitoring.**
6. **Communicate effectively with other salmon producers and managers.**

**Current Practices to Achieve Objectives** - For each of the above objectives (1 - 6), a description of current practices is provided to indicate how the objectives are to be achieved at the subject facility.

**Performance Standards** - For each of the six objectives, a table of information is presented summarizing how well hatchery operations have performed in achieving the objective. The most recent tables reporting performance standards for the seven permitted hatchery operations are included (IHOT 1996), updating performance information provided in the original 1993 WDFW Section 10 permit application.

***Recreational Fishery Monitoring Plans -***

Data from steelhead creel surveys conducted on upper Columbia River waters open to recreational steelhead harvest fisheries will be used to monitor harvest of marked HxH adults and impacts to wild and supplementation steelhead. These surveys would be scheduled using a stratified random sampling of weekdays and weekend days, morning and evening time periods, and adjusted to sample the time of year and areas where most angling effort occurs. Monitoring of spring/summer/fall mainstem Columbia River chinook fisheries and the associated impacts to steelhead will be conducted as required by NMFS Section 10 Permit #1248.

2. Specific actions -
Specific monitoring and evaluation actions proposed for the upper Columbia steelhead hatchery supplementation initiative will emphasize the collection of information allowing assessment of the success of the program in sustaining and rebuilding the natural steelhead population. Issues to be examined include the effects of the use of a local broodstock in improving hatchery fish performance, the use of fish culture to control residualization, the effects of hatchery steelhead outplanting methods on natural production, and the appropriate sample size for the collection of natural and hatchery fish at hatcheries (MCMCP 1997).

Following are specific elements that will be monitored and evaluated to allow appropriate assessment of supplementation program activities (MCMCP 1997). Many of the elements are already included in WDFW or IHOT hatchery monitoring and evaluation programs for the hatchery operations that are the subject of this application.

- implement a database management system at each hatchery facility that will include information regarding broodstock management, incubation and rearing, fish health maintenance, fish releases, smolt to adult survival rates, and tag/mark recaptures;
- evaluate fish cultural operations at each facility to determine survival of various release hatchery types to adult return, the efficacy of predator control devices, and the feasibility of alternative fish culture strategies;
- collect downstream smolt outmigration and adult return data to estimate the reproductive potential of hatchery and natural steelhead in the region;
- assess the need to develop local broodstock on the Wenatchee River through unmarked adult return monitoring and fish rearing feasibility studies at local hatcheries;
- continue to monitor steelhead preparedness for downstream migration at time of release, through evaluation of volitional emigration from rearing ponds, and assessing performance of acclimated versus scatter-planted fish;
- continue to conduct genetic evaluations that will help determine whether naturally-spawning steelhead in upper Columbia region tributaries are distinct from hatchery-produced steelhead;
- determine production allocation priorities for the watersheds during years when returns are low and habitat seeding and broodstock collection requirements are not met; and
- conduct creel censuses of fisheries directed on excess hatchery-origin steelhead to monitor harvest of adipose-clipped adults and impacts to wild and supplementation steelhead.

3. Monitoring actions by proposed activity -
a. Broodstock collection and adult returns -
The origin (hatchery or wild) of all steelhead encountered at WDFW hatchery steelhead trapping operations is identified by the absence or presence of an adipose fin, other identifying marks, and/or through scale analysis. Wild steelhead captured are readily identifiable because all hatchery-produced steelhead released in the upper Columbia River basin are mass-marked through removal of the adipose fin/ventral fin, utilization of VIE tags, coded-wire/cheek wire and/or

freeze brands. Daily, weekly and monthly counts of abundance of each population are maintained in WDFW Hatcheries Program databases (WDFW Form 5 - "Hatchery Adult Report") which will be made available to NMFS upon request. Any tag recoveries from steelhead at WDFW hatchery facilities in the region will be analyzed to identify stock origin and, if applicable, stray rates of non-natal stocks. WDFW will continue to conduct genetic analyses of steelhead (e.g. Phelps et al. 1997) to improve knowledge regarding straying, hatchery/wild stock interbreeding, the effects of hatchery introgression, and steelhead population diversity within the listed ESUs.

b. Juvenile rearing and releases -
Hatchery performance will continue to be monitored annually through the IHOT process. Included in IHOT hatchery performance monitoring is the determination of the success of each operation in meeting wild salmonid impact reduction criteria. Success in meeting smolt-only release, volitional release, and disease-free criteria will be among the factors monitored to gauge potential effects on listed steelhead.

c. Habitat -
Hatchery effluent quality will continue to be monitored twice monthly, consistent with NPDES Permit requirements developed for each facility. Reports of effluent quality will be maintained by WDFW and provided, as required, to the Washington Department of Ecology, the state agency authorized to regulate NPDES permitted discharges into public waters of the state. Performance information provided in annual IHOT reports will indicate the success of each hatchery operation in meeting impact minimization criteria for hatchery effluent. Appendix II details water quality parameters monitored at each facility (see "Objective 5: Conduct environmental monitoring.").

d. Removal of excess hatchery-origin adults -
The impacts to steelhead being removed at the Wells Dam and from the RSRF will be no more than what currently takes place for steelhead captured/examined and released during the currently-authorized activities to assess Wells Hatchery steelhead production group survival rates and broodstocking activities at RSRF. No further monitoring will occur of fish removed from these facilities and placed in ponds and lakes that are unconnected to the Columbia River system.

Data from steelhead creel surveys conducted on upper Columbia River waters and tributaries open to recreational steelhead fisheries will be used to estimate harvest of marked HxH adults and any associated negative impacts to wild and supplementation steelhead from a fishery. These surveys would be scheduled using stratified random sampling of weekdays and weekend days, morning and evening time periods, and adjusted to sample the time of year and areas where most angling effort occurs.

## VI. Description of the Listed Species that are the Subject of the Application:

***A. Take Levels by Life Stage by Proposed Activity.***
Tables identifying expected take of Upper Columbia River Steelhead ESU by activity is included as Appendix V.

**1) Broodstock collection and research.**
a) *Type of anticipated taking*:
Steelhead collected for the supplementation programs will be removed from the natural environment for artificial spawning at Wells or Eastbank hatcheries. This removal constitutes an intentional take of the listed species, and the fish will not be allowed to spawn naturally. Broodstock collection and spawning activities may also affect the genetic integrity and long term fitness of the naturally spawning steelhead populations through excessive straying of broodstock program progeny, collection of broodstock from the wrong stock, alteration of the donor stock genome through hatchery trait selection, and exacerbation of genetic drift and reduction of genetic diversity through reduction of the effective donor stock population size (MCMCP 1997).
Listed steelhead collected at Priest Rapids Dam will be held in a trap, anesthetized, sampled, tagged, revived, and released live upstream. No steelhead mortalities have been observed as a result of the sampling program at Priest Rapids Dam.

b) *Effects of the take*:
Take of listed steelhead for use in the supplementation programs will lead to mortality of hatchery and wild-origin fish collected at the trapping sites. Collection methods used may cause stress or injury to captured fish, possibly leading to pre-spawning mortality. However, artificial spawning methods employed will insure that progeny survive at a much higher rate than if the captured fish were allowed to spawn in the wild. The apparent value of hatchery production in the region in supporting the total steelhead return raises the issue of the effects of transition of the supplementation from relying on one broodstock source (Wells) to multiple broodstock sources. A rapid transition from a single source to a multiple source may initially lessen hatchery production, and ultimately, natural escapement (MCMCP 1997).

A primary objective of the programs is to minimize adverse genetic effects on the supplemented populations (MCMCP 1997). The hatchery stocks used appear to adequately represent locally-adapted stocks upstream of Priest Rapids Dam (WDF et al. 1993). The genetic integrity and long term fitness of progeny produced by collected broodstock may be compromised through inbreeding or outbreeding depression (Hard et al. 1992, Campton 1995). These genetic changes, if they occur, have the potential to lead to deleterious changes in the populations that decrease rather than increase the probability that the stocks will recover.

1. Broodstock collection -
Annual broodstock collection activities proposed through this permit application will lead to the trapping, handling and spawning of approximately 581 Upper Columbia ESU steelhead of hatchery and wild origin. Of this total, 373 hatchery or wild steelhead will be collected through

the Wells Hatchery trapping operations, with the remainder (208) taken as hatchery and wild origin from the Dryden and Tumwater dam trapping sites on the Wenatchee River. Assuming a the thirteen year (1989-2001) average passage of 5,461 steelhead at Wells Dam (J. Moore, WDFW, pers. comm.), and average volunteer arrivals to the hatchery trap of up to 60 steelhead, the proposed broodstock collection program at Wells will affect 6.7% of the total upriver-bound population (J. Moore, WDFW, pers. comm.).

Broodstock collection methods may stress or injure captured fish, leading to pre-spawning mortality. Five-year average prespawning survival of steelhead collected through the Wells hatchery program has been 98.3% (IHOT 1995). A prespawning mortality of approximately 1.7% of the annual total number of adults collected at Wells can therefore be expected.

If targeted collection levels have been attained for one group and not the other, trapping operations at Dryden and Tumwater dams may lead to the handling and upstream passage of steelhead that are surplus to hatchery or wild broodstock needs. Additional take may occur from steelhead during the Wenatchee River trapping operations. The number of steelhead that may be affected in this manner is unknown.

Listed steelhead originating in the Okanogan and Methow rivers may also be taken if broodstock collection operations within the watersheds are implemented to collect natural spawners, and if funding is available. Terminal traps on the Methow and Okanogan Rivers may lead to the collection of fewer than 20 natural steelhead, with the remainder of the broodstock used for the river supplementation program still originating from Wells Hatchery. These proposed efforts would be phased in gradually (over 8-10 years) to lessen impacts of broodstock collection on natural production. Broodstock secured in the rivers would lead to a one for one decrease in the total number of steelhead needed to meet the needs of each supplementation program at Wells. The methods used to collect broodstock, including traps and hook and line fisheries, may affect the movement, spawning activities, or migration timing of natural spawners. It is unlikely that these activities will significantly increase the potential for adult mortality, but the effectiveness of these fish spawning in the wild may be decreased.

2. Stock assessment and research -
Stock assessment activities at Priest Rapids Dam are expected to handle between 246 and 1,779 Upper Columbia ESU-origin steelhead each year (1986-2001 range). This range represents 6% to 11% of the steelhead population. Because the sample is collected through operation of the trap in one ladder at the dam 1.5 days per week, most of the returning steelhead are allowed to pass unimpeded, and no additional take of Upper Columbia steelhead is anticipated through this sampling program. In 16 years of operation, WDFW personnel have not experienced any mortalities of adult steelhead collected for this program at Priest Rapids Dam (L. Brown, Art Viola, K. Truscott, WDFW, pers. comms.). Trapping and sampling at Priest Rapids in future years is unlikely to lead to immediate mortality of listed steelhead. Stress, descaling and possible injury to captured fish is possible, which may lead to delayed mortality or decreased potential for successful spawning.

3. Reproductive Success Study
Additional trapping days may be required during broodstock collection activities in order to trap sufficient adult steelhead in the appropriate proportions for reproductive success experiments as described in Section C.1.g. The actual number of additional days would be dependent on trap efficiencies. A total 120 adults will be collected to fulfill the broodstock needs of the Reproductive Success Study.

**2) Juvenile rearing, transfers, and releases.**

**a.** *Type of anticipated taking*:
Factors associated with hatchery supplementation of smolts that may lead to take of the listed population include the potential loss of genetic diversity and fitness in the supplemented population resulting from outbreeding depression, inbreeding depression, genetic drift, or trait selection (Hard et al. 1992; Cuenco et al. 1993; Campton 1995). Ecological effects on natural fish by hatchery steelhead smolts released into the region through the supplementation program may also lead to takes in the tributaries, the Columbia mainstem and in the estuary. These effects can include competition, predation, disease transmission, and behavioral modification.

**b.** *Effects of the take:*
Listed steelhead may be taken through genetic and ecological effects of hatchery steelhead rearing, transfer, and release activities. Ecological interactions may result in direct and indirect impacts from the release of listed hatchery smolts into environments used by listed naturally-produced steelhead. These impacts are likely greatest in spawning and nursery areas and within release areas where fish densities are high. Genetic risks to wild steelhead may be imposed through interbreeding with hatchery-origin adults that overlap spatially and temporally on the spawning grounds.

1. Ecological effects -
a) Predation -
The Species Interaction Work Group (SIWG 1984) reported that there is an unknown level of risk of predation by hatchery steelhead on wild steelhead juveniles where they interact in freshwater migrational areas. Although the risk to wild fish is unknown, the group noted that predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to wild fish. Due to their location in the upper portions of the drainages and later time of emergence (late spring through August [MCMCP 1997]), wild steelhead fry are not likely to be vulnerable to predation by hatchery smolts. Smolts from the hatcheries are predominantly planted in mainstem river areas in April and May, which separates them spatially and temporally, to a significant degree, from newly-emerging steelhead fry. Witty et al. (1995) concluded that predation by hatchery production on wild salmonids does not significantly impact naturally-produced fish survival in the Columbia River migration corridor.

Predation by residual hatchery steelhead on wild salmonids may impact the health of wild steelhead populations (Pearsons et al. 1994). The rate of steelhead residualism is thought to average 5-10% of the number of fish released (NMFS 1995). Martin et al. (1993) reported a

residualism rate of 8.6% for a mid-April release group in the Tucannon River. Piscivorus behavior of steelhead and trout is reported to increase markedly when the fish exceed 250 mm total length, which is a size commonly exceeded by residual steelhead in Columbia River Basin migration corridors (Witty et al. 1995). Although residual steelhead of this size are present in migration corridors, they are not considered to be major predators of juvenile salmonids, as most that are observed are in poor condition and are thought not to survive long enough to become piscivorus (Witty et al. 1995). Practices employed at the WDFW hatcheries to minimize numbers of steelhead that will residualize should reduce the potential for residual hatchery steelhead predation on wild steelhead in the region.

Preliminary results from WDFW research on the Lewis River, in the lower Columbia River region, indicate low levels of hatchery steelhead smolt predation on salmonids. In a sample of 153 outmigrating hatchery-origin steelhead smolts captured through seining in the Lewis River between April and June 24, 12 fish (7.8%) were observed to have consumed juvenile salmonids (S. Hawkins, WDFW, pers. comm. July 1997). The juvenile salmonids contained in the steelhead stomachs appeared to be chinook fry. Sampling in this study indicated that no emergent wild-produced steelhead or trout fry (30-33mm fork length) were consumed during the first two months of sampling. The vast majority of Merwin Hatchery steelhead released had likely migrated from the river prior to the emergence of wild steelhead fry in 1997.

Large concentrations of hatchery steelhead released into the Upper Columbia tributaries may affect wild juvenile steelhead by stimulating predatory responses from bird and non-salmonid fish predators (Steward and Bjornn 1990). This potential increase in predation on wild fish is most likely to occur at the heads of reservoirs, faces of dams, turbine spillways, or bypass discharge areas.

b) Competition -
SIWG (1984) reported a high risk of ecological resource competition between hatchery steelhead and wild steelhead juveniles where they overlap in freshwater occurrence. Impacts from competition are assumed to be greatest in spawning and nursery areas and at release locations where fish densities are highest. These impacts likely diminish as hatchery smolts disperse, but resource competition may continue to occur at some unknown, but lower, level as smolts move downstream through the migration corridor. Steward and Bjornn (1990), however, concluded that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmon) may have different food and habitat preferences than wild fish, and that hatchery fish will be unlikely to out-compete wild fish.

Pearsons et al. (1994) reported that competition experiments in small enclosures within the North Fork Teanaway River suggested that competition between hatchery-reared steelhead and naturally-produced rainbow trout adversely impacted rainbow trout growth. Results from four successive annual experimental releases of 33,000 hatchery steelhead into a tributary of the river, however, showed no impacts to the sizes or densities of sympatric wild trout (Pearsons et al. 1994).

Hatchery-produced smolts emigrate seaward soon after liberation, minimizing the potential for competition with wild fish (Steward and Bjornn 1990). Competition between upper Columbia River hatchery-origin salmonids and wild salmonids, including steelhead, in the mainstem corridor was judged not to be a significant factor (Witty et al. 1995).

c) Behavioral effects -
High fish densities resulting from hatchery steelhead releases may cause displacement of rearing wild steelhead juveniles from jointly-occupied stream areas, leading to abandonment of advantageous feeding areas, or premature outmigration by wild juvenile steelhead. Pearsons et al. (1994) reported displacement of juvenile wild rainbow trout from discrete sections of streams by hatchery steelhead released into an upper Yakima River tributary. No large scale displacements of trout were detected. Small scale displacements and agonistic interactions that were observed between hatchery steelhead and wild trout resulted from the larger size of hatchery steelhead, which behaviorally dominated most contests. They noted that these behavioral interactions did not appear to significantly impact the trout populations examined, and the population abundance of wild salmonids did not appear to be negatively affected by releases of hatchery steelhead.

Release of only smolts from the hatchery programs will minimize temporal overlap between hatchery-released fish and juvenile wild steelhead in the individual rivers and in the Columbia River mainstem. The outplanting of only volitionally-migrating smolts by the hatcheries will help decrease density-dependent effects on wild fish, such as niche displacement and "pulling", leading to premature migration. Releases of hatchery smolts coincident with managed releases of water from dams (water budget releases) will help accelerate downstream migration of hatchery-released salmonids, further reducing spatial and temporal overlaps with wild fish.

d) Disease transmission -
Interaction between hatchery and wild-origin listed steelhead in the tributaries and mainstem areas may lead to fish pathogen transmission. Pathogen transmission has the potential to occur downstream from release locations, throughout the migration corridor. Although hatchery populations are considered to be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). Chapman et al. (1994) concluded that disease transmittal is probably not a major factor affecting wild steelhead.

Two methods significantly decrease the likelihood for transfer of disease from hatchery salmon to wild steelhead. Hatchery liberations coincident with water budget releases and rapid outmigration of released hatchery smolts limit the duration of interaction with wild fish. Adherence to fish disease control and minimization policies have been set forth for WDFW hatcheries (see IHOT [1995] Policy 403 - "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State"),

e) Estuarine interactions -

Dawley et al. (1986) reported that movement rates of steelhead through the estuary and into the ocean are higher than observed migration rates from release sites to the estuary. They reported that this finding generally indicates that the use of the Columbia River estuary by juvenile salmonids originating from upstream areas is limited in duration compared to that of other west coast estuaries. Chapman et al. (1994) also reported that steelhead smolts move rapidly through the Columbia estuary.

The minimal overlap of hatchery and wild steelhead in the estuary reduces the likelihood for adverse effects through competition, predation, or disease transmission. In evaluating the potential impacts due to competition, Witty et al. (1995) determined that increasing the number of hatchery steelhead in or just upstream of the estuary is unlikely to affect natural populations of anadromous fish.

On-station release of only smolts through volitional release practices and size, size variation, and time at release criteria from the lower river hatcheries is believed to reduce the duration of estuarine residence, thereby minimizing adverse effects on wild steelhead rearing or migrating through the area.

f) Level of incidental take associated with ecological effects -
The level of incidental take of listed steelhead resulting from juvenile hatchery steelhead production in the upper Columbia River region is unknown. Although considerable literature qualitatively describes the various impacts of hatchery practices and production on natural fish populations, there is little or no information quantifying those impacts. It is not possible to quantify listed juvenile steelhead mortality or take levels that may result from the supplementation program. This is due to the inherent biological characteristics of the listed fish, the scale and variability of the Columbia Basin river systems, and the operational complexity of the subject hatchery actions. We believe that requiring and maximizing the release of only smolts for most production in the region, combined with outplanting of volitionally-migrating fish, will limit the interaction between listed hatchery and wild steelhead, leading to insignificant levels of incidental take of wild fish.

An additional consideration is that the number of steelhead proposed for release in the Upper Columbia tributaries is designed to produce sufficient spawners to meet escapement objectives for production of naturally-produced smolts in subsequent years. Hatchery steelhead planting levels proposed in this permit application are therefore tailored to the carrying capacity of the receiving environment. We are not proposing increases in steelhead production above levels occurring when the annual basin production ceiling was set by NMFS (NMFS 1995). Production levels described herein should therefore comply with those deemed appropriate to address basin-wide ecological carrying capacity concerns and to minimize density-dependent effects on listed species.

2. Genetic effects -

a) Genetic risks

Genetic risks to the wild steelhead population may occur through hatchery spawning and rearing practices that decrease the genetic integrity and/or fitness of steelhead reared in the hatchery. NMFS (1996) concluded that the current major threat to genetic integrity for steelhead in this ESU arises from past and present hatchery practices. Risk factors can include loss of genetic variability: a) between populations through outbreeding depression, and b) within populations through inbreeding depression, genetic drift, and trait selection (NMFS 1996; Campton 1995; Cuenco et al. 1993; CBFWA 1996). In particular, NMFS (1996) has reported a strong concern regarding potential problems of genetic homogenization due to hatchery supplementation within the ESU.

In recent years, research based primarily on findings for Kalama River summer-run steelhead has suggested that interbreeding between non-indigenous Skamania hatchery steelhead (a highly-selected, inbred stock) and native wild fish may negatively affect the genetic diversity and long term reproductive success of wild steelhead (Leider et al. 1990; Hulett et al. 1996). Non-indigenous hatchery and native wild steelhead crosses may be less effective at producing adult offspring in the natural environment than wild fish (Chilcote et al. 1986). Qualifying the risks of hatchery introgression to wild fish, Campton (1995) noted the need to distinguish the biological effects of hatcheries and hatchery fish from indirect and biologically independent effects of human factors related to management. His review of the scientific literature for steelhead indicated that most genetic effects detected to date appear to be caused by hatchery or fish management practices such as stock transfers and mixed stock fisheries on hatchery and wild fish, and not by biological factors intrinsic to hatcheries or hatchery fish (Campton 1995).

b) Level of take associated with genetic effects -

The level of incidental take of listed steelhead that may occur through hatchery introgression is unknown. WDFW intends to minimize potential adverse genetic effects resulting from hatchery management practices by implementing a hatchery supplementation program that encourages local adaptation to ecologic conditions in the region. Activities including donor stock selection, hatchery rearing practices, subbasin stock transfers, and release practices will be designed to minimize genetic impacts to the listed steelhead population that may result from hatchery intervention.

3) Removal of Hatchery-origin Adults Excess to Recovery and Broodstocking Needs

a. Type of take

1. Removal at traps

Removal of steelhead at Wells Dam and RSRF facilities will be no more than what currently takes place for steelhead captured/examined and released during the currently-authorized activities to assess Wells Hatchery steelhead production group survival rates and facility operations at RSRF.

2. Removal through authorized recreational fisheries
Authorized recreational fisheries would result in direct take to marked HxH hatchery-origin Upper Columbia River Steelhead ESU and incidental direct take of those unmarked steelhead that are encountered and released by anglers.

b. Effects of the take:
1. Removal at traps and fishways.
The effects on steelhead being removed at these facilities will be no more than what currently takes place for steelhead captured/examined and released during the currently-authorized activities to assess Wells Hatchery steelhead production group survival rates and through broodstock activities at RSRF.

2. Removal through authorized recreational fisheries
A literature review by Rawding (2000) of hooking mortality on wild steelhead indicates that adults caught during winter conditions (in cool [<50°F] water), including those caught with bait, sustain hooking mortalities of 1.1%, while year-round fisheries sustained a hooking mortality of 3.7%. If we assume a 5% handling mortality on all steelhead caught and released, the modeled impacts will not cause upper Columbia River steelhead returns to fall below established recovery and broodstock goals as displayed in Table 10 and Appendix IV.

***B. Physical description of animals to be taken.***
1) Adult fish -
Adult summer steelhead enter the Columbia River between May and September (NMFS 1996). Data for upper Columbia wild steelhead adults passing Priest Rapids Dam indicate average ages at return of 47% 1-salt, 51% 2-salt, and 2% 3-salt. Upper Columbia-origin steelhead pass Rock Island Dam from July through the following May. The fish arrive at the Wenatchee basin from mid-July through April, and in the Entiat basin from October through March (WDF et al. 1993).

Steelhead in this ESU may remain in fresh water for up to a year prior to spawning. Wild steelhead spawn from April through June, and possibly into July in the upper river tributaries (L. Brown, pers. comm. July 1997; WDF et al. 1993). Peak spawning in the tributaries occurs in late May. Little to no spawning occurs in the mainstem Columbia River.

2) Juvenile fish
c. Steelhead occurrence and smolt migration timing -
Various life stages of wild Upper Columbia ESU steelhead are present year-round in the Wenatchee, Okanogan, Entiat, and Methow river basins. Juvenile fish rear and over-winter in the mainstem upper Columbia River. Deposited eggs incubate from late March through June, and fry emerge in late spring through August, and possibly into September in higher elevation tributaries. Fry and smolts disperse downstream in late summer and fall. Upper Columbia River steelhead produced above Rock Island Dam out-migrate as age 2+ (43.2%) or 3+ (46.4%) smolts (Peven 1990) during April and May at an average size of 163-188 mm (Chapman et al. 1994). Smolts of up to seven years in age have been reported for this region (NMFS 1996).

Steelhead smolts from this region exhibit peak downstream passage at Rock Island Dam from May 13 (1987 observations reported in Peven et al. 1987) to May 23 (1985 observations reported in FPC 1987). The 1985-1989 average peak migration was May 18, with the central 80% passage at the dam between May 6 and May 31 (Peven and Fielder 1989). The average size of naturally-produced upper Columbia-origin steelhead smolts migrating downstream past Rock Island Dam was 160-180 mm in fork length (Peven and Fielder 1988; 1989; 1990; Chapman et al. 1994).

Steelhead smolts originating above McNary Dam (representing upper Columbia and Snake river-origin populations) exhibit average peak passage at McNary Dam from May 7 through May 26 (1984-86 observations reported in Fish Passage Center [FPC 1987]). Steelhead smolt travel time from the Methow River to McNary Dam ranges from 14 to 20 days, dependent upon mainstem river flows (Chapman et al. 1994). Central 80% passage of out-migrating smolt at McNary occurred between April 25 and May 22, based on 1984-86 smolt passage observations (FPC 1987).

The timing of salmonid smolt migrations into the estuary depends primarily on dates of smolt releases from hatcheries and river flow (Dawley et al. 1986). Yearling steelhead migrations were observed between 1978 and 1983 in the Jones Beach area of the Columbia estuary. These observations determined that the peak migration occurred during the second week of May in 1980 and 1981), the third week of May in 1978 and 1979, and the last week of May in 1982 and 1983 (Dawley et al. 1986). Steelhead smolts move rapidly through the estuary, traveling seaward at rates of 20 to greater than 59 km/day (1978 and 1980 data). Dawley et al. (1986) reported that movement rates through the estuary represented a 50% increase over rates recorded for steelhead migrating from up-river areas to the estuary. Assuming average outmigration rates of 20 to 59 km/day, and a 75km distance from Jones Beach to the ends of the jetties at the mouth of the Columbia River, steelhead smolts would be expected to travel through the entire Columbia River estuary in approximately 2 to 4 days (Dawley et al. 1986).

***C. Specific Dates and Locations of Take.***

Specific dates and locations of take are presented in section IV. above. In general, adult fish will be taken in the summer, fall, and winter months through broodstock trapping and spawning activities, and stock assessment activities at Priest Rapids Dam. Adult steelhead will be taken from October 1 through March 31 during recreational fisheries in tributary waters and the mainstem Columbia River above Priest Rapids Dam. Adult steelhead will be taken from September 16 through March 31 during recreational fisheries in the mainstem Columbia River below Priest Rapids Dam in the downstream portion of the Hanford Reach (from the U.S. Highway 12/395 Bridge at Pasco upstream to the Old Hanford Townsite wooden powerline towers, a distance of 32 miles). Adult steelhead will be taken in fisheries from October 1 through the end of the annual adult migration (June 15) at the RSRF. Juvenile hatchery steelhead will be taken year-round, in association with fish propagation activities at the hatcheries. Wild juveniles may be taken during hatchery steelhead smolt releases that occur during April and May each year.

***D. Description of the Status of the Species.***

This application is submitted in response to NMFS' August 11, 1997 listing of Upper Columbia River Steelhead ESU as "Endangered" under the ESA. This steelhead population utilizes the upper and lower Columbia River and the Columbia River estuary as juvenile rearing areas and as migration corridors for both smolts and returning adults. Activities proposed under this permit application pertain to the upper Columbia River portion of the species' range.

1. Distribution and Population Status:

The Upper Columbia River Steelhead ESU includes populations originating from all areas of the Columbia River basin upstream of the Yakima River. Major production areas include the Wenatchee, Methow, and Entiat rivers. The Okanogan River also has a small spawning run (Chapman et al. 1994). WDF et al. (1993) identified three stocks within this ESU, which were all considered to be of mixed origin, wild production, and depressed. Recent (1997-2001) five-year average total escapement past Priest Rapids Dam was 8,606 adult steelhead, and the 2002 cycle return is projected to be 29,844. Estimated natural cohort replacement ratios for the run above Priest Rapids Dam averaged 0.33 : 1.0 for brood years 1982-1990 (Brown 1995).

NMFS (1996) noted the clear failure of natural stocks to replace themselves in recent years. Major risk factors to this ESU include habitat problems related to irrigation diversions and hydroelectric dams, urbanization, livestock grazing, and blockages to migration caused by dams on the mainstem and tributary rivers. Genetic homogenization resulting from hatchery supplementation is also viewed as a risk factor (NMFS 1996). Based upon the population status of the species, and risk factors affecting the likelihood for its continued existence, NMFS determined that the Upper Columbia River Steelhead ESU warrants protection under the ESA as "endangered".

a. Natural and hatchery population sizes -

1) Adult fish.

The numbers of listed steelhead adults that may be affected by the proposed broodstock collection and research activities are indicated by total run size and escapement estimates as indicated below. Historically, run sizes of Upper Columbia River steelhead ESU were greater than 10,000 fish (Table 1) during the 1980s and early 1990s and again in 2000 (11,364) and 2001 (preliminary estimate 29,844). Run sizes from 1993 through 2001 averaged 9,934 fish. The 11-year (1989-99) average Methow and Okanogan river systems (H. Bartlett, WDFW, pers. comm.) and five-year (1989-93) average Wenatchee River system (NMFS 1996, WDF et al. 1993) run size and escapement estimates are as presented in Table 11.

**Table 11.** Upper Columbia Steelhead ESU wild and hatchery-origin steelhead average run size and escapements.

| River Basin | Run Size | Escapement | Wild-origin Escapement | Hatchery-origin Escapement |
|---|---|---|---|---|
| Wenatchee | 2,700 | 2,500 | 800 | 1,700 |
| Methow & Okanogan | 3,950 | 3,100 | 350 | 2,800 |
| Entiat | unknown | unknown | unknown | unknown |
| Total | ~6,650 | ~5,600 | ~1,150 | ~4,500 |

2) Juvenile fish.

a. Wild production -

The population status of listed steelhead smolts produced in the region has been estimated by WDFW (L. Brown, WDFW pers. comm). The number of steelhead juveniles that may be produced are indicated by the following subbasin production capacities for wild steelhead smolts in the region (WDF et al. 1993; MCMCP 1997):

| | |
|---|---|
| Wenatchee | 62,167 |
| Entiat | 12,739 |
| Methow | 58,552 |
| Okanogan | 17,570 |
| Total | 151,028 |

Recent ten-year (1987-96) average seeding levels estimated for the region indicate potential wild smolt production at 109.5% of the modeled production capacities (MCMCP 1997):

| | |
|---|---|
| Wenatchee | 73,371 |
| Entiat | 10,728 |
| Methow | 65,586 |
| Okanogan | 15,660 |
| Total | 165,345 |

b. Hatchery production -

Wells Hatchery steelhead stock are included as a component of the Upper Columbia River Steelhead ESU and are considered in the overall status of the listed population. WDFW-managed supplementation program will produce and release of approximately 1,030,000 listed steelhead smolts annually into upper Columbia Basin tributaries. This number includes 450,000 smolts produced at Wells Fish Hatchery, 200,000 produced at Chelan/Turtle Rock, and 200,000 produced at Eastbank Hatchery. Additional Wells HxH steelhead are provided as eyed eggs to RSRF (240,000 eggs) and to Winthrop NFH (125,000 eggs) each year. These eggs are used to produce approximately 180,000 smolts at Ringold Springs and 100,000 smolts at Winthrop for

release into the mainstem Columbia and Methow rivers respectively. Because the facilities are funded through federal sources, authorization for the rearing and release of Wells steelhead from the Winthrop and Ringold Springs hatcheries will be requested through a separate Section 10 permit application, prepared and submitted by the appropriate agencies.

**E. Description of the manner of taking.**
The methods used to take listed steelhead are described in section IV. above. Detailed descriptions of traps and holding ponds used at each hatchery involved in taking listed fish are presented in operations plans included in Appendix II.

**F. Names and Qualifications of Persons Capturing or Taking Listed Steelhead.**
The hatchery programs that are the subject of this permit application are managed and operated by WDFW. All individuals involved in the activities described in this permit application are employees of WDFW, and are therefore acting under the authority of the agency. Personnel involved in the take of listed steelhead for the purposes of the upper Columbia steelhead supplementation program will include WDFW fisheries biologists, fisheries technicians, hatchery managers, and hatchery technicians. The names and qualifications of individuals directly involved in the described supplementation activities are presented below.

Andrew Murdoch, Fish Biologist 4, (509-664-3148) is the Mid-Columbia Region project leader responsible for the steelhead supplementation and research activities proposed in this permit application. Mr. Murdoch has an M.S. in biology from Central Washington University and has 7 years experience as a professional fisheries biologist. Mr. Murdoch has been active in the on-going upper Columbia region steelhead supplementation effort since its inception in 1997. He will be assisted in the project by Charlie Snow, Fish Biologist 2. Mr. Snow holds an B.S. degree in fisheries biology from the Central Michigan University and has 6 years of experience as a professional fisheries biologist. All individuals participating at the field level are professionally trained in methods that will allow for the safe capture and effective propagation of listed steelhead. The names and qualifications of WDFW personnel responsible for each specific supplementation activity proposed in the permit application are as follows:

**Priest Rapids Dam Stock Assessment -**
Kirk Truscott, (509) 664-1227; Fish Biologist 3, Project Coordinator, 19 years experience as a professional fisheries biologist.
Ted Anderson, (509) 932-4481; Priest Rapids Complex Manager; 23 years with WDFW

**Wells Complex (Wells and Methow hatcheries and associated fish trapping facilities) -**
Jerry Moore, (509) 923-2728; Complex Manager; 35 years with WDFW
Bob Jateff-Biologist 2, Methow Evaluation-Methow Hatchery - 24 years with WDFW
Gary Osborne, Hatchery Specialist 4; Wells Hatchery; 18 years with WDFW
Heather Bartlett, (509) 826-7341; Fish Biologist 3, Region 2 - 11 years with WDFW
Kirk Truscott, Fish Biologist 3, 19 years experience as a professional fisheries biologist

**Eastbank Complex (Eastbank, Turtle Rock, and Chelan Hatcheries and associated broodstock trapping facilities) -**
Rick Stilwater, (509) 884-8301; Complex Manager; 33 years with WDFW
John Penny, Hatchery Specialist 4; Eastbank Hatchery; 30 years with WDFW
Art Viola, (509) 665-3337; Fish Biologist 3, Area Fish Biologist
Mike Tonseth, Fish Biologist 2, 8 years with WDFW
Todd Miller, Fish Biologist 1, 5 years with WDFW
Kirk Truscott, Fish Biologist 3, 19 years experience as a professional fisheries biologist

**Priest Klickitat Complex (Ringold Springs Rearing Facility, Klickitat Hatchery and associated rearing facilities) -**
Ted Anderson, (509) 773-6731; Complex Manger, 25 years with WDFW
Vacant, Ringold Springs Rearing Facility; (509) 269-4448
Ron Ballard, (509) 364-3310; Hatchery Specialist 4, Klickitat Hatchery, 16 years with WDFW

**G. Use of Contractors**
WDFW will not be contracting with any individuals or companies for the performance of the proposed activities.

## VII. Description of Transportation Manner for Animals Taken, Imported, Exported, or Shipped in Interstate Commerce.

WDFW has no plans to take, import, export, or ship any listed steelhead in interstate commerce as part of this permit application.

## VIII. Description of Care and Maintenance of Listed Steelhead.

The facilities where listed steelhead will be maintained, and the methods/practices employed to care for the fish are completely described in Appendix II.

***A. Dimensions of holding facilities.***
Dimensions of fish holding and rearing structures that will be used to trap, hold, and rear steelhead at the Wells, Eastbank, Chelan, and Turtle Rock hatcheries are included in "Plan Views" presented for each hatchery in Appendix II. Dimensions of fish trapping facilities that are not described in the attached hatchery operations plans that will be authorized under this permit are as follows:

Dryden Dam Traps -
Adult capture traps are operated on the left and right banks of the Dryden Diversion Dam. The left bank trap is comprised of a V-shaped weir leading into a holding tank at the top of the fish passage ladder. The area of the trap where fish are held measures 10.5' long x 8' wide, with depth varying between 6'-7', depending on river flow. The right bank trap is situated at the base of the dam. A V-shaped weir centered in one side of a 10' x 40' x 6'-8' deep is used to capture and hold

fish. From this holding area, fish are either taken for use as broodstock or shunted into a *Denil* ladder for upstream passage. Both traps at Dryden are run daily. Fish may therefore be held up to 24 hours prior to transport to Eastbank Hatchery or passage upstream.

Tumwater Dam Trap-
The trap is situated at the top of the fish ladder on the left bank. Fish are trapped through closure of a gate at the top of the trap, which prevents upstream passage, maintaining the fish in a 10' x 50' x 8' deep holding pond. The pond lacks a "V" entry, and fish are therefore not prevented from returning to downstream areas. The trap is actively run, with fish allowed to exit the pond upstream via a *Denil* ladder shunted into a 4' x 4' holding box for immediate loading into a tanker truck. The fish may also be passed into the dam forebay in this manner.

Wells Dam Trap -
Fish traps at Wells Dam are located in the ladders on both the east and west sides of the dam. Steelhead broodstock are trapped each year, typically in the west side trap. Fish reaching the top of the west side ladder ascend a 12' *Denil* fish ladder into a 12' x 12' x 8' deep holding tank. Captured fish can then be directed from the holding tank over a false weir leading to a "V" shaped chute, which funnels the fish into an underground pipe leading to a 12' x 100' pond, where broodstock are held for spawning. Movement of fish in this manner is automatic, and none are handled with nets, which could damage the fish.

Priest Rapids Dam Trap -
The trap in Priest Rapids Dam is located at the top of the right bank ladder. A gate is closed in the ladder, and upstream-migrating fish are entrained into a *Denil* ladder, where they are either shunted to the dam forebay or into a temporary brail for sampling. The temporary brail measures 6' wide x 4.5' long x (up to) 12' deep. The trap is actively operated and fish are transferred immediately from the temporary brail to sampling tanks.

***B. Water supply, amount, and quality.***
Water sources, the total amount available and distributed to rearing/holding ponds, and the quality of water used at the facilities are described in the operations plans included in Appendix II.

***C. Fish diet, amount, and type.***
A high quality, fish meal-based, artificial, moist fish feed will be used to rear juvenile steelhead to smolt size at each facility. The size of feed and amount fed each day will depend upon fish size. In general, feeding rates will be maintained at a rate of 1.8% total body weight of the rearing population per day. Adult steelhead held for spawning will not be fed.

***D. Sanitation practices.***
Sanitation practices that will be used at each facility are described in the attached hatchery operations plans (Appendix II). Sanitation procedures employed to reduce the transfer and incidence of fish diseases are in accordance with Washington co-manager fish health and IHOT (1995) guidelines.

***E. Qualifications and experience of the staff.***
The names, qualifications, and experience of staff involved in caring for and maintaining listed steelhead are provided in section V. F. above.

## IX. Statement of Willingness to Participate in a Cooperative Breeding Program

WDFW is willing to participate in a cooperative breeding program for Upper Columbia River steelhead. The breeding and production programs described in this application are consistent with activities described in the MCMCP, a joint agency initiative (of which NMFS is a party) designed to preserve and restore healthy naturally-producing steelhead in the region (MCMCP 1997).

## X. How the Program will Enhance and Benefit the Wild Population

As stated previously, NMFS concluded that the naturally-produced steelhead population in the Upper Columbia River region is clearly not replacing itself (NMFS 1996). Total abundance of steelhead within the ESU has been relatively stable or increasing in recent years only because of hatchery supplementation programs (NMFS 1996). Hatchery production has strongly dominated spawning escapements, with estimates of recent contributions in the Wenatchee River averaging 65% and 81% in the Methow and Okanogan Rivers. This ESU might not exist today if there were no hatchery production using indigenous Upper Columbia region steelhead brood stocks (NMFS 1996).

Continuation of the steelhead supplementation program described in this permit application will help ensure that the Upper Columbia steelhead population is preserved and restored in the region until major habitat-related factors affecting the productivity and survival of wild fish can be remedied. The proposed supplementation program is intended to facilitate recovery of the natural population, minimizing the risk of further decline and restricting genetic changes resulting from artificial propagation. Measures designed to minimize and mitigate impacts to listed fish are described in the above sections. When implemented, these measures will help address potential negative genetic and/or ecological consequences of the proposed supplementation program.

## XI. Information Regarding All Endangered or Threatened Species Captured or Maintained.

### *A. Identification of previous permits obtained to work with endangered or threatened species.*

WDFW possesses several Section 10 permits issued by NMFS to allow the take of listed fish associated with agency activities in Washington waters:

**Permit 1094** authorizes the take of ESA-listed anadromous fish associated with operation of Hatchery Supplementation program for endangered Upper Columbia River steelhead.

**Permit 1218** authorizes the take of adult and juvenile ESA-listed upper Columbia River steelhead associated with research activities in the basin.

**Permit 1114** authorizes the take of ESA-listed upper Columbia River spring chinook salmon and steelhead associated with studies involving the smolt monitoring program at Rock Island Dam.

**Permit 1203** authorizes the take of ESA-listed upper Columbia River salmon and steelhead associated with research activities in the upper Columbia River Basin.

**Permit 1196** - Artificial production of upper Columbia spring chinook - applied for in 1998; has not yet been issued. Activities described in the application for this permit have been authorized under terms and conditions of the Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999).

**Permit 1248** - Recreational fisheries directed on unlisted species in the upper Columbia River basin.

**Permit 1347** - An application for incidental take of upper Columbia spring chinook and steelhead resulting from the propagation of unlisted sockeye, summer and fall chinook at Eastbank, Wells, Priest Rapids, Lake Wenatchee sockeye, and cooperative releases was submitted in December, 1999 to replace Section 10 Permits 901/902, which have expired. Activities described in the application for this permit have been authorized under terms and conditions of the Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999).

**Permit 1126** - Authorizes the take of threatened Snake River spring/summer chinook salmon in the Snake River basin for research, monitoring and evaluation.

**Permit 1129** - Authorizes the take of threatened Snake River spring/summer chinook salmon in the Tucannon River for broodstock purposes at Tucannon Fish Hatchery.

**Permit 1103** - Determine adult steelhead numbers and timing at Bonneville Pool, and determine genetic composition of steelhead and chinook from Indian fisheries in Bonneville Pool.

**Permit 1345** - Authorizes incidental take of listed salmon and steelhead during boat electrofishing activities to determine stock assessment for warmwater species and in the Yakima River gravel pit avulsion study.

***B. Endangered or threatened species taken since the species were listed.***

The maximum number of listed adult and juvenile salmon and steelhead handled each year under Section 10 permits issued to WDFW is specified in each individual permit. Actual numbers handled have generally been below this figure, and have been documented in annual reports submitted to NMFS as required under the terms and conditions for each permit.

The number of ESA-listed adult and juvenile salmon and steelhead taken indirectly as a result of hatchery salmon and steelhead releases from WDFW-managed hatcheries in the Columbia Basin is unknown.

***C. Take levels for other salmon species***.

Other salmon species collected and propagated at WDFW-managed hatcheries in the upper Columbia River region include sockeye, summer chinook, and fall chinook. Mortalities associated with these species in hatchery operations can result from handling injuries, fungal infection, and various types of fish diseases. Histories of reportable pathogens at each hatchery are presented in Appendix II.

***D. Steps taken to avoid or decrease mortalities.***

Mortalities experienced for other species captured and reared in upper Columbia region hatcheries have been within expected levels. Mortalities associated with adult trapping operations have been low, due to frequent monitoring and careful handling of captured fish. Fish disease outbreaks among juvenile fish reared at the hatcheries are minimized and controlled in accordance with IHOT (1995), Pacific Northwest Fish Health Protection Committee, and Washington Co-manager Fish Health Policy procedures.

## IX. Certification:

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that this information is submitted for the purpose of obtaining a permit under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

## X. Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Ross Fuller
Chief, Fish Management Division
Fish Program
Washington Department Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

## XIV. Sources of Data:

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